

IBM FlashSystem A9000R
Version 12.0.2.c

Release Notes



Second Edition (February 2017)

This edition applies to IBM FlashSystem A9000R version 12.0.2.c. Newer document editions may be issued for the same product version in order to add missing information, update information, or amend typographical errors. The edition is reset to 'First Edition' for every new product version.

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Overview

IBM FlashSystem® A9000R is a high-end, all-flash storage system that delivers ultra-fast storage together with mission-critical features, including data reduction by compression and inline deduplication, smart scaling, distributed data, automatic load balancing, and a multitude of advanced enterprise-class features and capabilities.

As a pre-integrated rack offering, IBM FlashSystem A9000R comprises grid controllers and flash enclosures that are interconnected by integrated InfiniBand switches, forming a scale-out grid fabric that delivers exceptional IOPS performance.

In its core architecture, IBM FlashSystem A9000R utilizes IBM FlashCore™ technology together with IBM® MicroLatency® modules, providing high density, low latency, and storage reliability. In addition, IBM FlashSystem Enhanced Endurance Technology reduces flash disk wearout and ensures long-term durability of the flash storage components, even under heavy workloads.

IBM FlashSystem A9000R is ideal for large enterprises that rely on fast, redundant, and high-capacity data storage, offering high service levels for dynamic workloads and easy hyper-scaling, while supporting multi-tenant environments, flexible consumption models, and robust cloud automation and integration capabilities. IBM FlashSystem A9000R offers security and data protection through advanced remote mirroring, hot encryption, and self-healing mechanisms.

For more detailed information about IBM FlashSystem A9000R, refer to its user documentation and online information.

What's new in version 12.0.2.c

Software version 12.0.2.c is a hotfix release that resolves miscellaneous issues.

General availability date: 7 December 2016

For information about the resolved issues, see “Change log” on page 3.

Hot upgrade from earlier versions

Version 12.0.2.c supports direct non-disruptive upgrade (hot upgrade) from the following software versions.

- 12.0.2.b
- 12.0.2.a
- 12.0.1

Note: These hot upgrade paths are valid for the time of the general availability (GA) date of version 12.0.2.c. However, hot upgrade from additional earlier versions could be supported later on. For up-to-date information, contact IBM Support.

The upgrade must be performed by an authorized IBM service technician.

Prior to initiating software upgrade, consult with IBM Support regarding the required time allocation and expected duration of the upgrade procedure.

Note: The system e-license may automatically prompt in the management GUI upon the first post-upgrade operation, if the e-license was updated since it was last accepted. In such a case, the new e-license must be accepted before any GUI operation can be performed.

Management and automation tools

IBM FlashSystem A9000R version 12.0.2.c can be managed and monitored with IBM Hyper-Scale Manager version 5.1 or later.

IBM Hyper-Scale Manager version 5.1 provides an advanced web-based graphical user interface (GUI) from which one or more IBM FlashSystem A9000R (or A9000) systems can be managed and monitored in real time from a web browser.

IBM FlashSystem A9000R can also be managed from its command-line interface (CLI) or through representational state transfer (REST) application programming interfaces (APIs).

IBM FlashSystem A9000R customers are entitled to free use of IBM Hyper-Scale Manager, which can be obtained at any time from the IBM Fix Central website (ibm.com/support/fixcentral).

IBM Spectrum Control™ Base Edition

IBM FlashSystem A9000R version 12.0.2.c is supported by IBM Spectrum Control Base Edition version 3.0.x or later, which provides the following VMware platform integration tools.

- IBM Storage Provider for VMware VASA
- IBM Storage Enhancements for VMware vSphere Web Client
- IBM Storage Plug-in for VMware vRealize Orchestrator
- IBM Storage Management Pack for VMware vRealize Operations Manager

For more information, see IBM Spectrum Control Base Edition on IBM Knowledge Center (ibm.com/support/knowledgecenter/STWMS9).

IBM FlashSystem A9000R customers are entitled to free use of IBM Spectrum Control Base Edition, which can be obtained at any time from either the IBM Hyper-Scale Manager software package or from the IBM Fix Central website (ibm.com/support/fixcentral).

Available cloud storage solutions

IBM FlashSystem A9000R version 12.0.2.c can be integrated with various independent software vendor (ISV) platform, application, virtualization, and cloud environments.

To facilitate this integration, IBM provides the following software solutions, also referred to as cloud storage solutions.

Cloud storage solution	Version	Compatibility note
IBM Storage Host Attachment Kit	2.6.0 or later	Available for: HP Unix, IBM AIX®, Linux (Red Hat Enterprise Linux; SUSE Linux Enterprise Server), Microsoft Windows Server, and Oracle Solaris.
IBM Storage Driver for OpenStack	1.7.0 or later	Version 1.7.0 supports only the OpenStack Mitaka release
IBM Storage Management Pack for Microsoft System Center Operations Manager (SCOM)	2.6.0 or later	
IBM XIV® Provider for Microsoft Windows Volume Shadow Copy Service (VSS)	2.8.0 or later	
IBM XIV Storage Replication Adapter	2.3.0 or later	For use with VMware Site Recovery Manager. Requires the use of synchronous remote mirroring.

IBM FlashSystem A9000R customers are entitled to free use of the IBM cloud storage solutions, which can be obtained at any time from the IBM Fix Central website (ibm.com/support/fixcentral).

For more information about the available cloud storage solutions for IBM FlashSystem A9000R, see '**Platform and application integration**' section in the IBM FlashSystem A9000R space on IBM Knowledge Center (ibm.com/support/knowledgecenter/STJKN5).

Change log

This change log summarizes the enhancements and fixes in the different 12.0.x code level versions of IBM FlashSystem A9000R.

Note: New functional features of these versions are only briefly summarized. For a detailed summary of the new functional features of a specific version, refer to the 'What's new' section of its release notes.

Version 12.0.2.c (December 2016)

Version 12.0.2.c of IBM FlashSystem A9000R resolves the following issues.

Ticket ID	Description
SYS-282848	<p>Fixed: In extremely rare cases, invalidated data might overwrite correct data in the deduplication dictionary. This could lead to returning invalid data to a host, resulting in undetected data corruption.</p> <p>Upgrading to version 12.0.2.c is required in order to resolve this issue.</p> <p>Severity: HIPER</p> <p>Affected versions: 12.0.2 or later</p>

Ticket ID	Description
SYS-283677	<p>Fixed: In very rare cases, extremely rapid creation of snapshots while other snapshots are being deleted might lead to undetected data corruption and/or to loss of access to the storage system.</p> <p>Upgrading to version 12.0.2.c is required in order to resolve this issue.</p> <p>Severity: HIPER</p> <p>Affected versions: 12.0.2 or later</p>
SYS-283428	<p>Fixed: In rare cases, creating or deleting snapshots of asynchronously mirrored volumes might result in host disconnection.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.2 or later</p>
SYS-284179	<p>Fixed: In rare cases, an internal software process might cause grid controller failure, requiring grid controller restart by IBM Support.</p> <p>Severity: Moderate</p> <p>Affected versions: 12.0.2 or later</p>

Version 12.0.2.b (October 2016)

Version 12.0.2.b of IBM FlashSystem A9000R resolved the following issues.

Ticket ID	Description
SYS-280575	<p>Fixed: Use of snapshots could significantly decrease the overall storage system performance.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.0 or later</p>
SYS-282999	<p>Fixed: IBM has recently learned of an extremely unlikely theoretical scenario where a small segment of data can be lost. This can happen in the presence of snapshots or a volume copy operation when a grid controller fails in combination with very rare set of circumstances. The data loss will go undetected. Should this rare scenario occur with a snapshot, the incorrect data will be on the snapshot while the volume being written to will be unaffected.</p> <p>It should be noted this scenario has not been encountered in test or in the field. The probability of this scenario to occurring is further reduced with version 12.0.2.a. This rare scenario cannot occur if snapshots or the volume copy command are not used.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.0 or later</p>

Ticket ID	Description
SYS-283139	<p>Fixed: In rare cases, when using asynchronous remote mirroring, highly-utilized systems might have insufficient system resources, which could lead to host disconnection.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.2 or later</p>
SYS-283201	<p>Fixed: In rare cases, a memory leak might lead to exhaustion of particular system memory resources, resulting in host disconnection.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.2 or later</p>
SYS-283230	<p>Fixed: A very specific write pattern in conjunction with an internal space compaction process might lead to host disconnection.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.2 or later</p>
SYS-283272	<p>Fixed: In an extremely rare scenario, when a SCSI WRITE_SAME command with zeros is used, blocks that were not explicitly written by the application might contain non-zero data. This will be undetected.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.2 or later</p>
SYS-283343	<p>Fixed: In rare cases, an issue in the media defragmentation process might lead to exhaustion of system memory resources and eventually cause host disconnection.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.2 or later</p>
SYS-283142	<p>Fixed: When using asynchronous remote mirroring, a manually triggered sync job fails to start.</p> <p>Severity: Moderate</p> <p>Affected versions: 12.0.2.a</p>
SYS-281973	<p>Fixed: Inaccurate physical capacity usage might be reported when deleting a volume or a storage pool after the volume or storage pool was at full capacity.</p> <p>Severity: Service</p> <p>Affected versions: 12.0.0 or later</p>

Version 12.0.2.a (September 2016)

Version 12.0.2.a started enforcing limitations on user configuration of asynchronous remote mirroring in order to avoid impact on the system performance. It also added support for hot upgrade from earlier software versions.

For more information about the enforced limitations, see “Limitations” on page 9.

Version 12.0.2 (September 2016)

Version 12.0.2 of IBM FlashSystem A9000R added support for asynchronous remote mirroring and resolved the following issues.

Ticket ID	Description
SYS-282248	<p>Fixed: In rare cases, an initialization failure that could occur in the cache node might cause the cache node to halt.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.0 or later</p>
SYS-282406	<p>Fixed: In rare scenarios, data reduction nodes might not work properly after upgrading to software version 12.0.1, and some hosts might receive data medium errors.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.1</p>
SYS-282508	<p>Fixed: In a very rare and specific scenario, a failure in the cache node might cause host disconnection.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.0 or later</p>
SYS-282718	<p>Fixed: In rare cases, the system might enter maintenance mode due to a failure in the vault data encryption process.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.1</p>
SYS-282527	<p>Fixed: When using UPN notation to specify LDAP users, recovery keys cannot be verified.</p> <p>Severity: Moderate</p> <p>Affected versions: 12.0.0 or later</p>
SYS-279455	<p>Fixed: The SCSI inquiry page C0 byte 3 reports the system's RAID type. The code incorrectly reports RAID 10, while it should report RAID 5.</p> <p>Severity: Low</p> <p>Affected versions: 12.0.0 or later</p>

Ticket ID	Description
SYS-280926	<p>Fixed: Capacity optimization is not applied on the data migration target. The occupied space is identical to the size of the original volume, even if the original volume contains a large amount of zeros. This empty space is eventually cleared through the inline pattern detection mechanism.</p> <p>Severity: Low</p> <p>Affected versions: 12.0.0 or later</p>

Version 12.0.1 (August 2016)

Version 12.0.1 of IBM FlashSystem A9000R added support for synchronous remote mirroring. It also included performance enhancements and resolved the following issues.

Ticket ID	Description
SYS-281392	<p>Fixed: In rare cases, if a grid controller fails during a hot upgrade procedure, it might cause all grid controllers to fail.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.0 or later</p>
SYS-282017	<p>Fixed: After the system is operating continuously for a few months, a grid controller might fail.</p> <p>Severity: High Impact</p> <p>Affected versions: 12.0.0 or later</p>
SYS-279484	<p>Fixed: Data-at-rest encryption is not applied on the SSD vault device that holds user data from the write cache during emergency shutdown situations.</p> <p>Severity: Moderate</p> <p>Affected versions: 12.0.0 or later</p>
SYS-279304	<p>Fixed: Latency is indicated in the performance statistics, even when the actual Input/Output Operations Per Second (IOPS) rate is close to 0.</p> <p>Severity: Low</p> <p>Affected versions: 12.0.0 or later</p>

Version 12.0.0.c (July 2016)

Version 12.0.0.c of IBM FlashSystem A9000R included the following fixes.

Ticket ID	Description
SYS-281016	Fixed: If a grid controller or cache node fails and then at some future point a volume is formatted, a volume is deleted, or VAAI issues a write_same command (with zeros), it is possible that in rare cases, the data which was not explicitly written by the application might contain data other than the expected zeros. This will be undetected. Severity: High Impact Affected versions: 12.0.0 or later
SYS-281468	Fixed: If a snapshot of a volume is deleted, a very rare instance of undetected data corruption on a small part of the volume might occur. Severity: High Impact Affected versions: 12.0.0 or later

Version 12.0.0.a (May 2016)

Version 12.0.0.a of IBM FlashSystem A9000R included the following fixes.

Ticket ID	Description
SYS-278135	Fixed: In some rare cases, a disabled canister in the flash enclosure might still be able to de-stage data slices for which it served as the primary canister. This could potentially compromise the validity of saved data. Severity: High Impact Affected versions: 12.0.0
SYS-279855	Fixed: Emergency shutdown is not automatically carried out if more than three grid controllers fail in a rack configuration that contains 6 grid controllers. Severity: Moderate Affected versions: 12.0.0
SYS-279491	Fixed: In some cases, LDAP authentication might fail over an SSL connection, causing a 20-minute delay before the authentication can be carried out again. Severity: Service Affected versions: 12.0.0

Version 12.0 (April 2016)

Version 12.0 was the first software version of IBM FlashSystem A9000R, and included the following functional features:

- Flash-optimized data reduction, including inline deduplication and compression
- Flash-optimized data path and data protection
- Capacity statistics
- Space-efficient snapshots and consistency groups
- Redirect-on-Write (ROW)
- Quality of Service (QoS) performance classes
- Data-at-rest encryption
- Multi-tenancy
- System performance metrics, including history metrics of no less than 300 days
- Remote support and proactive support

For more information about these features, refer to the IBM FlashSystem A9000R Product Overview publication.

Limitations

As opposed to known issues, limitations are functionality restrictions that are part of the predefined system design and capabilities in a particular version.

Note: For information about specification-related functional boundaries, such as maximum number of volumes and hosts per storage system, refer to the IBM FlashSystem A9000R specification sheet document, which can be provided to IBM customers under non-disclosure agreement (NDA).

Asynchronous mirroring use limitations

Use of asynchronous remote mirroring is subject to the following configuration limitations in order to sustain performance:

- Interval: 1–10 minutes
- Minimum Recovery Point Objective (RPO): 2 minutes
- Number of mirrored volumes: up to 200

Important: The interval and RPO limitations are enforced by the management CLI and GUI. However, the maximum number of mirrored volumes (200) is not enforced by the management GUI and CLI, and should be taken into account by the storage administrator.

Known issues

This section details the known issues in IBM FlashSystem A9000R version 12.0.2.c, along with possible solutions or workarounds (if available).

The following severity levels apply to known issues:

- **HIPER** – High Impact Pervasive. A critical issue that IBM has either fixed or plans to fix promptly. Requires immediate customer attention or code upgrade.
- **High Impact** – Potentially irrecoverable error that might impact data or access to data in rare cases or specific situations/configurations.
- **Moderate** – Limited functionality issue and/or performance issue with a noticeable effect.

- **Service** – Non-disruptive recoverable error that can be resolved through a workaround.
- **Low** – Low-impact usability-related issue.

Important:

- **The issues listed below apply to version 12.0.2.c or earlier versions.** As long as a newer version has not yet been released, a newer release notes edition for version 12.0.2.c might be issued to provide a more updated list of known issues and workarounds.
 - When a newer version is released for general availability, the release notes of version 12.0.2.c will no longer be updated. Accordingly, check the release notes of the newer version to learn whether any newly discovered issues affect version 12.0.2.c or whether the newer version resolves any of the issues listed below.
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Ticket ID	Severity	Affected versions	Description
SYS-276739	High Impact	12.0.1 or later	<p>In rare cases when synchronous mirroring is used, a component failure on the slave volume side might cause I/Os served by the master volume to fail.</p> <p>Workaround: No workaround is currently available.</p>
SYS-283113	High Impact	12.0.1 or later	<p>In a scenario of an encrypted system that is shut down and then powered on while the Tivoli® Key Lifecycle Manager (TKLM) is not accessible, the recovery keys might not work and access to the system could be denied.</p> <p>Workaround: Contact IBM Support to regain access to the system.</p>
SYS-280320	Moderate	12.0.0 or later	<p>In rare cases of workloads that include a mixture of 4 KB random write and read, an increase in latency might occur upon intensive access to a volume with snapshots.</p> <p>Workaround: To avoid this issue, consider the following actions:</p> <ol style="list-style-type: none"> 1. Maintain a high cache hit ratio. 2. Use a larger block size. 3. Disable snapshot usage for that specific volume.
SYS-280406	Moderate	12.0.2 or later	<p>Upon the creation of a snapshot, the system I/O latency could increase, for a duration of up to several minutes.</p> <p>Workaround: No workaround is currently available.</p>
SYS-281258	Moderate	12.0.0.a or later	<p>Wrong compression and deduplication ratio values are reported after volume deletion, due to inaccurate available space optimization.</p> <p>Workaround: No workaround is currently available.</p>

Ticket ID	Severity	Affected versions	Description
SYS-282831	Moderate	12.0.2 or later	<p>Performance improvements that were introduced in version 12.0.2 cannot be applied on data that was written to the system prior to upgrading to version 12.0.2.</p> <p>Workaround: When experiencing performance issues with data that was written to the system prior to upgrading to version 12.0.2, contact IBM Support.</p>
SYS-282945	Moderate	12.0.2 or later	<p>When asynchronous remote mirroring is used, the latency could increase.</p> <p>Workaround: No workaround is currently available.</p>
SYS-279815	Service	12.0.0 or later	<p>If a MicroLatency module card that is pulled out of the flash enclosure when the enclosure's internal redundancy state is either 'Synching' or 'Degraded', the management GUI indicates that the card has a spare, even if no spare is available.</p> <p>Workaround: Use the flash_card_list CLI command to display the correct status of spares.</p>
SYS-280124	Service	12.0.0 or later	<p>Numerous MODULE_BBU_IS_CHARGING and MODULE_BBU_IS_FULL events are issued during the periodic discharge of a grid controller's battery backup unit (BBU).</p> <p>Workaround: These events can be ignored.</p>
SYS-280653	Service	12.0.0 or later	<p>Some CLI commands might hang when storage pools are being cleaned from snapshots.</p> <p>Workaround: In such a case, wait until the command is carried out.</p>
SYS-282223	Service	12.0.0 or later	<p>Data migration over Fibre Channel (FC) does not work if the number of LUNs per host exceeds 255.</p> <p>Workaround: To resolve this issue, use 255 or less LUNs per host.</p>
SYS-282621	Service	12.0.2 or later	<p>When asynchronous remote mirroring is used over a low-bandwidth connection, host performance may be impacted.</p> <p>Workaround: To resolve this issue, increase the bandwidth between the two remote locations.</p>
SYS-276870	Low	12.0.0 or later	<p>When a grid controller is replaced, or whenever the system is undergoing a software initiation process, data reduction saving statistics could be temporarily inaccurate. The statistics accuracy is regained as data is being accessed and processed again.</p> <p>This issue has a noticeable effect only after 1 TB or less has been written to the system.</p> <p>Workaround: No workaround is currently available.</p>

Ticket ID	Severity	Affected versions	Description
SYS-279421	Low	12.0.0 or later	Time stamp is incorrect in statistics reported over SMI-S. Workaround: No workaround is currently available.
SYS-280703	Low	12.0.1 or later	If snapshot space is not configured, a misleading error appears when trying to create a mirror snapshot and the operation fails. To avoid this error, make sure that the snapshot space is configured before trying to create a snapshot mirror.

Related information and publications

You can find additional information and publications related to IBM FlashSystem A9000R on the following information sources.

- IBM Flash Storage marketing website (ibm.com/systems/storage/flash)
- IBM FlashSystem A9000R on IBM Knowledge Center (ibm.com/support/knowledgecenter/STJKN5)
- IBM FlashSystem A9000 on IBM Knowledge Center (ibm.com/support/knowledgecenter/STJKMM)
- IBM Storage Redbooks® website (redbooks.ibm.com/portals/storage)

Getting information, help, and service

If you need help, service, technical assistance, or want more information about IBM products, you can find various sources to assist you. You can view the following websites to get information about IBM products and services and to find the latest technical information and support.

- IBM website (ibm.com®)
- IBM Support Portal website (ibm.com/storage/support)
- IBM Directory of Worldwide Contacts website (ibm.com/planetwide)
- IBM service requests and PMRs (ibm.com/support/servicerequest/Home.action)

Use the Directory of Worldwide Contacts to find the appropriate phone number for initiating voice call support. Voice calls arrive to Level 1 or Front Line Support.

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