

IBM Cloud Object Storage System  
3.16.0 June Maintenance

*Release Notes*



This edition applies to IBM Cloud Object Storage System™ and is valid until replaced by new editions.

© **Copyright International Business Machines Corporation 2022.**

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

---

# Contents

- Support information.....iv**
- Chapter 1. New Features and Improvements in ClevOS 3.16.0..... 1**
- Chapter 2. Interface Modifications..... 2**
- Chapter 3. Resolved Issues..... 4**
  - Resolved issues in 3.16.0 June Maintenance..... 4
  - Resolved issues in 3.16.0 February Maintenance..... 4
  - Resolved issues in 3.16.0 January Maintenance..... 5
  - Resolved issues in 3.16.0 December Maintenance..... 5
  - Resolved issues in 3.16.0 November Maintenance..... 5
  - Resolved issues in 3.16.0..... 5
- Chapter 4. Product Alert Notifications..... 6**
- Chapter 5. Known issues.....7**
  - Upgrading and Installation..... 8
  - Container..... 8
  - Alerting and Reporting..... 8
  - System Behavior..... 9
  - Storage Pools..... 9
  - Data Evacuation..... 9
  - System Configuration..... 9
  - Deleting objects..... 9
  - Manager Web Interface..... 10
  - Vaults.....10
  - Vault Mirrors.....10
  - Vault migration.....10
- Chapter 6. Supported Hardware Platforms..... 11**
  - IBM Cloud Object Storage Appliances..... 11
  - Hewlett Packard Enterprise.....11
  - Seagate.....12
  - Cisco.....12
  - Dell.....12
  - Lenovo.....13
  - Quanta Cloud Technology (QCT)..... 13
- Chapter 7. Incompatible Hardware and Firmware with ClevOS..... 14**
  - Broadcom.....14
  - Hewlett Packard.....14
  - IBM Cloud Object Storage Appliances.....14
  - Seagate.....15
  - Supermicro.....15
- Notices.....16**
  - Trademarks..... 17

## Support information

---

Technical support contacts.

For more information on the product or help with troubleshooting, contact IBM Support at [ibm.com/mysupport](https://ibm.com/mysupport) or visit the [Directory of worldwide contacts](#).

---

# Chapter 1. New Features and Improvements in ClevOS 3.16.0

## **Expiration Lifecycles for Versioned Objects and Incomplete Multipart Uploads in Container Mode (1697)**

The ClevOS system currently allows users to easily manage stale data by configuring expiration lifecycle on a bucket. This system only supported regular (non-versioned) objects in the past, disallowing users from enabling expiration on versioning-enabled container vaults (and vice versa). This feature extends object expiration to include versioned objects and incomplete multipart uploads. Users with versioned buckets and work flows that create incomplete MPUs can now take advantage of expiration lifecycle to manage their usage.

## **Add new channel for external management services (1786)**

A new channel was created to support a new subnet/VLAN configuration to access external services.

---

## Chapter 2. Interface Modifications

### API updates for ClevOS 3.15.7 have been referenced in the following documentation:

- REST API Developer Guide
- Cloud Storage Object (CSO) API 2.5 Developer Guide

### API updates for ClevOS 3.15.1 have been referenced in the following documentation:

- Container Mode Service API Guide
- CSO API 2.5 Developer Guide
  - COS-71196, hard quota support for buckets was originally added as part of F1342 (update to Service API). In the course of development for F1616, the following fix was added. First, it was found that the response when the hard quota is exceeded was using vault mode terminology. As part of the fix, the **<Code>** and **<Message>** fields were updated to the output below.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Error>
  <Code>BucketQuotaExceeded</Code>
  <Message>The specified bucket hard quota has been exceeded.</Message>
  <Resource>/container/test</Resource>
  <RequestId>00000000-0000-0000-0000-000000000000</RequestId>
  <statusCode>507</statusCode>
</Error>
```

### API updates for ClevOS 3.15.0 have been referenced in the following documentation:

- REST API Developer Guide

### API changes for ClevOS 3.14.13 have been referenced in the following documentation:

- *Cloud Storage Object API 2.5 Development* guide (COS-76460/COS-76461)
  - PUT ACL for an Object in the Versioning Enabled bucket, with a non-existent version returned a 404 error code. However no information was included in the error code, message, and field. New behavior is updated to include the following fields as part of the response:
    - Error code: NoSuchVersion
    - Error message: The specified version does not exist.
    - Extra fields: <Key>object\_name</Key><VersionId>requested\_version\_id</VersionId>
  - PUT/GET ACL for an Object with VersionId which has a delete marker returned a 404 error code. New behavior is updated to return a 405 error code with the below fields as part of the response.
    - Error code: MethodNotAllowed
    - Error message: The specified method is not allowed against this resource.
    - Extra fields: <Method>method</Method><ResourceType>DeleteMarker</ResourceType>
- *Cloud Storage Object API 2.5 Development* guide (COS-73284)
  - New behavior is updated to include the header x-amz-version-id in the response for a PUT object for a version enabled bucket only when the versioning mode is ENABLED. Previously, the x-amz-

version-id header was included with a value of “null” in the PUT Object response when the versioning mode was SUSPENDED. This behavior is updated and the x-amz-version-id header is not included in the response.

New behavior is updated to include header x-amz-delete-marker with a value of “true” to be returned for GET/HEAD/DELETE object operations only when the object has a delete marker.

- GET/HEAD for an Object in the Versioning Enabled bucket, with a non-existent version returned a 404 error code. However no information was included in the Error code, message and field. New behavior is updated to include the following fields as part of the response.

Error code: NoSuchVersion

Error message: The specified version does not exist.

Extra fields: <Key>object\_name</Key><VersionId>requested\_version\_id</VersionId>

- GET/HEAD for an Object with VersionId which has a delete marker returned a 404 error code. New behavior is updated to return a 405 with the below fields as part of the response.

Error code: MethodNotAllowed

Error message: The specified method is not allowed against this resource.

Extra fields: <Method>method</Method><ResourceType>DeleteMarker</ResourceType>

- GET/HEAD for an Object in the Versioning Suspended bucket using the versionid=null returned a 404 error code. New behavior is updated to return the object if present and return a 200 error.

---

## Chapter 3. Resolved Issues

### Resolved issues in 3.16.0 June Maintenance

---

Issue	Description
COS-89985	Improved the Zone Slice Storage full disk recovery tool which would sometimes fail in certain drive states.
COS-89984	Resolved an issue with the Zone Slice Storage manual compaction tool where it would fail to make progress and run indefinitely.
COS-89636	Resolved an issue where the service would crash on Slicestor <sup>®</sup> Devices in the presence of malformed disk identifiers.
COS-87845	Improved the visibility check used to prevent corrupt object created by PUT request that failed with a 500 error.
COS-82441	Resolved an issue on some models of Lenovo-based Slicestor <sup>®</sup> Devices, for which OS RAID arrays may erroneously report degraded/optimal after upgrade to affected releases.
COS-17176	An advanced configuration parameter has been added to allow an administrator to set an alert threshold for network interface speeds. This is useful for preventing erroneous alerts for degraded network interface speeds when intentionally running at a rate less than the network interface's maximum speed. For more information on how to utilize this configuration parameter, contact IBM Support.

### Resolved issues in 3.16.0 February Maintenance

---

Issue	Description
COS-55305	Resolved an issue to reduce impact of reconciling logical usage after an unclean shutdown.
COS-82035	Resolved an issue to reduce impact of infrequently removing old references to bin files.
COS-82036	An advanced config parameter is added to allow an administrator to change the threshold when old references to bin files are infrequently removed.
COS-85224	Resolved an issue that resulted in false errors being reported in the device logs.
COS-85688	Resolved an issue where object write times could increase through the duration of an upgrade when upgrading from a release prior to ClevOS release 3.15.0 to a release 3.15.0 or newer. This problem was more likely to manifest on systems running higher workloads that were closer to maximum system throughput.
COS-86006	Fixed an issue that could cause the name index entries for a versioned object to become inconsistent after a crash or a failed write if the current version of that object is a delete marker.



<i>Table 2. Resolved issues (continued)</i>	
<b>Issue</b>	<b>Description</b>
COS-87107	Resolved an issue where in a vault mode systems, upgrading Accesser® Appliances before Slicestor® Devices, to a ClevOS release 3.16.0 or higher, was causing 500 errors.

## Resolved issues in 3.16.0 January Maintenance

---

<i>Table 3. Resolved issues</i>	
<b>Issue</b>	<b>Description</b>
	Nothing to report.

## Resolved issues in 3.16.0 December Maintenance

---

<i>Table 4. Resolved issues</i>	
<b>Issue</b>	<b>Description</b>
	Nothing to report.

## Resolved issues in 3.16.0 November Maintenance

---

<i>Table 5. Resolved issues</i>	
<b>Issue</b>	<b>Description</b>
COS-84483	Resolved an issue with SNMP Alert Forwarding which leads to permit exhaustion and prevents the device from reporting status to the IBM Cloud Object Storage Manager™.
COS-84521	An issue was resolved in which some Manager to device communication was prevented when external device certificates were used.
COS-85038	Resolved an issue where intent (storage type 4) slices were not cleaned up when one or more stores in a stripe were down, potentially leading to intent storage limit errors

## Resolved issues in 3.16.0

---

<i>Table 6. Resolved issues</i>	
<b>Issue</b>	<b>Description</b>
	Nothing to report.

## Chapter 4. Product Alert Notifications

IBM® clients with an IBM ID may sign up to receive product alert notifications that contain important information that may impact the use of the IBM Cloud Object Storage System™. In order to receive these notifications, clients need to subscribe to the "IBM Cloud Object Storage System™" product in [MyNotifications](#). The table below represents the alert notifications that are applicable while running this latest version of ClevOS at the time of this release note publication. For any questions regarding the content of these product notifications, contact IBM Support.

*Table 7. Product Alert Notifications for the IBM Cloud® Object Storage System*

<b>Alert Notification Title</b>	<b>Impacted ClevOS™ Releases</b>	<b>Alert Notification Published Date</b>
<a href="#">Potential communication alert on the IBM COS Manager®</a>	ClevOS 3.15.8.106, 3.15.8.111, 3.16.0.28, 3.16.1.24	Oct 6, 2021
<a href="#">Expiration of "DST Root CA X3" root certificate interaction with COS</a>	All ClevOS releases	Sep 30, 2021
<a href="#">Slicestor® disks may unexpectedly transition to a DIAGNOSTIC state.</a>	ClevOS 3.15.3 and future releases	Sep 10, 2021
<a href="#">Performance implications of non-homogenous COS storage pool expansions</a>	All ClevOS releases	Jun 30, 2021
<a href="#">API changes related to S3 Object Versioning</a>	3.15.7 and future releases	Apr 19, 2021
<a href="#">Issue with adding multiple drives in a IBM COS Slicestor® appliance</a>	All ClevOS releases	Jul 20, 2020
<a href="#">A firmware issue can cause IBM COS Gen2 HW nodes to fail to boot up</a>	ClevOS independent	Jun 18, 2020
<a href="#">Java™ version incompatibility preventing IPMI access</a>	ClevOS independent	Mar 12, 2018
<a href="#">IPMI Configured via nut Command Does Not Persist on Device Restart</a>	ClevOS independent	Jun 27, 2017
<a href="#">Drive-managed Shingled Magnetic Recording (SMR) drives are not approved and should not be used with named-object protocol workloads</a>	ClevOS independent	Mar 16, 2017
<a href="#">IBM COS Slicestor® 2584 Fails to Attach Drives</a>	ClevOS independent	Feb 2, 2017

## Chapter 5. Known issues

*Table 8. Known issues*

<b>Issue</b>	<b>Failing Condition</b>	<b>Disposition</b>
COS-58128	DLM cannot process more than 16 hot-swap events at once.	This issue will be fixed in a future release.
COS-50579	There is a known issue where slice data being reallocated from one Slicestor device to another would not be appropriately removed from the source Slicestor device if the reallocation process was erroneously marked as complete."	This issue still exists in 3.14.3 because the change was reverted in the latest fix.
COS-11201	In the Event Console of the Manager User Interface, the event details section for failing disk migration events contains a parameter that is called Migration Progress. However, it is not clear what this value represents.	This value corresponds to the percentage of failing disk migration that is complete.
COS-11355	Replacing a failed drive with another failed drive results in an inconsistent view on the Manager User Interface. On the Monitor Device page, in the "Summary of device health" section, both the replaced failed drive and the new failed drive are shown. The "Drive Information and Actions" view of the drive layout shows the replaced failed drive. On the Maintenance page, the FRU report contains the replaced failed drive.	Perform another replacement of the failed drive with a good drive.
COS-13575	The "stop migration" operation for failing disk migration on the Manager User Interface (UI) can take ~20 seconds to complete after being initiated by the user. The button continues to be enabled during this time. This issue exists for dispose and reset disk operations as well.	Do not hit the button again until the operation completes. If the drive stays in the same state for more than 20 seconds, perform a refresh of the page. If the drive continues to stay in this state, follow the recommended action that is provided in the Manager Administration Guide under disk lifecycle management.
COS-10031	When resuming a drive in the DIAGNOSTIC state from the Manager User Interface, it can take ~20 seconds to complete. The resume button is not disabled during this time.	Do not hit the resume button until the operation completes. If the drive stays in the DIAGNOSTIC state for more than 20 seconds, perform a refresh of the page. If the drive continues to stay in this state, follow the recommended action that is provided in the Manager Administration Guide under disk lifecycle management.

Table 8. Known issues (continued)

Issue	Failing Condition	Disposition
COS-10445	When using the storage command from the localadmin shell on a Slicestor® device, it is possible to resume all drives that are currently in the DIAGNOSTIC state. However, in some cases, this process can take too long, which will cause the command to return an error code -15 due to a timeout.	Despite the error, the resume process is continuing in the background. The storage list command can be used to monitor the progress of resume process.
COS-13504	When failing a quarantined drive, it is possible that after data has been migrated off the failing drive, the Manager event console will report that no data migration was attempted.	No action is required. Despite the event description, data migration will always be attempted unless the user specifically chooses to skip migration via the localadmin shell storage command.
COS-23962	Vault quotas are static and do not update when storage pool capacities change. If a system expansion, set replacement, or set removal is performed on the storage pool, vault quotas for any vaults on that pool will not update to consider the new capacity.	The user-defined vault quotas work as expected. However, they cannot be consistent with the current storage pool capacity. For example, a vault quota can be higher than total storage pool capacity after a set removal.

## Upgrading and Installation

Table 9. Upgrading and Installation

Issue	Failing Condition	Disposition
	Nothing to report	

## Container

Table 10. Container

Issue	Failing Condition	Disposition
COS-15401	If a user attempts to create a management vault by using "manual configuration" (accessed through the Configure Management Vault page) based on an existing vault template, management vault creation fails with the following message: "Cannot create a management vault from this template. It is deployed to access pools with standard vaults"	Use the "automatic configuration" available on the Configure Management Vault page.

## Alerting and Reporting

Table 11. Alerting and reporting

Issue	Failing Condition	Disposition
	Nothing to report.	

## System Behavior

Table 12. System behavior

Issue	Failing Condition	Disposition
	Nothing to report.	

## Storage Pools

Table 13. Storage pools

Issue	Failing Condition	Disposition
COS-2642	On the *Monitor Storage Pool Page, the <b>Reallocation Progress</b> graph, which displays historical data, is inaccurate when a device is down or statistics are not collected for a window of time.	The <b>Data Reallocation</b> progress bar, available at the top of the *Monitor Storage Pool Page, is always accurate. This view reflects the status and should be used to monitor progress of the data reallocation activity.

## Data Evacuation

Table 14. Data evacuation

Issue	Failing Condition	Disposition
	Nothing to report.	

## System Configuration

Table 15. System configuration

Issue	Failing Condition	Disposition
	Nothing to report.	

## Deleting objects

Table 16. Deleting objects

Issue	Failing Condition	Disposition
	Nothing to report.	

## Manager Web Interface

Issue	Failing Condition	Disposition
COS-10031	When resuming a drive in the DIAGNOSTIC state from the Manager User Interface, it may take ~20 seconds to complete. The resume button is not disabled during this time.	Do not hit the resume button until the operation completes. If the drive stays in the DIAGNOSTIC state for more than 20 seconds, perform a refresh of the page. If the drive continues to stay in this state, follow the recommended action that is provided in the Manager Administration Guide under disk lifecycle management.
COS-23764	Upon network failure while going through the one time setup process in the manager, a network error page appears. When the network comes back, reload the page, at which point an internal server error page appears in some scenarios.	Log out of the internal server error page and log back into the manager, which will take you through one time setup again.

## Vaults

Issue	Failing Condition	Disposition
	Nothing to report	

## Vault Mirrors

Issue	Failing Condition	Disposition
	Nothing to report.	

## Vault migration

Issue	Failing Condition	Disposition
COS-12442	When a vault migration finishes the work that is contained in its TODO queue, it kicks off a process to calculate the exact count of the number of objects that are migrated as part of the migration. This process of calculating the exact size is performed by each device in the target pool, and can take a long time to complete for large migrations.	

## Chapter 6. Supported Hardware Platforms

### IBM Cloud Object Storage Appliances

*Table 21. Minimum Version of ClevOS Compatible with IBM Hardware Platforms*

Product Name	Machine Type (1Yr/3Yr Warranty)	Model	Minimum ClevOS
IBM COS Accesser® 3105	3401/3403	A00	3.8.1
IBM COS Accesser® 4105	3401/3403	A01	3.8.1
IBM COS Accesser® 3110	4958/4957	A10	3.14.4
IBM COS Manager™ 3105	3401/3403	M01	3.8.1
IBM COS Manager™ 3110	4958/4957	M10	3.14.4
IBM COS Slicestor® 2212	3401/3403	S00	3.8.1
IBM COS Slicestor® 2448	3401/3403	S01	3.8.1
IBM COS Slicestor® 3448	3401/3403	S02	3.8.3
IBM COS Slicestor® 2584 (AP-TL-1)	3401/3403	S03	3.8.1
IBM COS Slicestor® 2584 (AP-LS-1)	3401/3403	S03	3.13.1
IBM COS Slicestor® 2212A	3401/3403	S10	3.10.0
IBM COS Slicestor® 12	4958/4957	C10/J10	3.14.4
IBM COS Slicestor® 53	4958/4957	C10/J11	3.14.4
IBM COS Slicestor® 106	4958/4957	C10/J12	3.14.4
IBM COS Slicestor® 92 IBM Cloud Object Storage System™	4958/4957	C10/J15	3.15.5

**Note:** □ Requires RPQ

### Hewlett Packard Enterprise

*Table 22. Minimum Version of ClevOS Compatible with Hewlett Packard Enterprise Hardware*

Appliance	Model	Minimum ClevOS
Manager Appliance	DL360P Gen8	3.2.1
Manager Appliance	DL360 Gen9	3.5.0
Manager Appliance	DL380 Gen9	3.5.0
Manager Appliance	DL360 Gen10	3.14.0
Accesser® Device	DL360P Gen8	3.2.1
Accesser® Device	DL360 Gen9	3.5.0
Accesser® Device	DL360 Gen10	3.14.0
Accesser® Device	DL380 Gen9	3.5.0

Table 22. Minimum Version of ClevOS Compatible with Hewlett Packard Enterprise Hardware (continued)

Appliance	Model	Minimum ClevOS
Slicestor® Device	SL4540 Gen8	2.9.0
Slicestor® Device	DL380 Gen9	3.5.0
Slicestor® Device	Apollo 4200 Gen9	3.6.0
Slicestor® Device	Apollo 4200 Gen10	3.14.10
Slicestor® Device	Apollo 4510 Gen9	3.6.0
Slicestor® Device	Apollo 4510 Gen10	3.14.0
Slicestor® Device	Apollo 4530 Gen9	3.6.0

## Seagate

Table 23. Minimum Version of ClevOS Compatible with Seagate Hardware

Appliance	Model	Minimum ClevOS
Seagate OneStor®	AP-2584 1 AP-TL-1	3.4.2
Seagate Exos®	AP 5U84-Laguna Seca	3.15.0

## Cisco

Table 24. Minimum Version of ClevOS Compatible with Cisco Hardware

Appliance	Model	Minimum ClevOS
Cisco Slicestor® Device	UCS C3260	3.7.4
Cisco Slicestor® Device	UCS S3260 (Single Node)	3.12.0
Cisco Slicestor® Device	UCS S3260 (Dual Node)	3.12.0
Cisco Slicestor® Device	UCS S3260 M5 (56 drive configuration)	3.13.1
Cisco Slicestor® Device	UCS S3260 M5 (60 drive configuration)	3.14.3
Cisco Manager Appliance	UCS C220 M4	3.12.0
Cisco Accesser® Device	UCS C220 M4	3.12.0
Cisco Manager Appliance	UCS C220 M5	3.13.6
Cisco Accesser® Device	UCS C220 M5	3.13.6
Cisco Slicestor® Device	UCS C240	3.13.6

## Dell

Table 25. Minimum Version of ClevOS Compatible with Dell Hardware

Appliance	Model	Minimum ClevOS
Dell Slicestor® Device	DSS 7000	3.10.1



Table 25. Minimum Version of ClevOS Compatible with Dell Hardware (continued)

Appliance	Model	Minimum ClevOS
Dell Slicestor® Device	R740xd w/ HDD Support	3.14.1
Dell Slicestor® Device	R740xd w/ NVMe Support	3.14.2
Dell Slicestor® Device	R740xd2	3.14.9

## Lenovo

Table 26. Minimum Version of ClevOS Compatible with Lenovo Hardware

Appliance	Model	Minimum ClevOS
Lenovo Manager Appliance	X3550 M5	3.10.1
Lenovo Accesser® Device	X3550 M5	3.10.1
Lenovo Manager Appliance	X3650 M5	3.10.1
Lenovo Manager Appliance	SR630	3.13.6
Lenovo Accesser® Device	SR630	3.13.6
Lenovo Slicestor® Device	SR650	3.13.6

## Quanta Cloud Technology (QCT)

Table 27. Minimum Version of ClevOS Compatible with QCT Hardware

Appliance	Model	Minimum ClevOS
QCT Manager Appliance	QuantaGrid D51PH-1ULH	3.13.4
QCT Accesser® Device	QuantaGrid D51PH-1ULH	3.13.4
QCT Slicestor® Device	QuantaGrid D51PH-1ULH	3.13.4

# Chapter 7. Incompatible Hardware and Firmware with ClevOS

**The hardware components running firmware revisions listed below are incompatible with ClevOS due to the possibility of unexpected behavior.**

**Note:** If you have any hardware on this list running the firmware revisions listed, please contact L3 support immediately to create an upgrade plan. You can determine your firmware revisions using the Firmware Report that is found under the Maintenance menu.

## Broadcom

Table 28. Broadcom Hardware and Firmware Incompatibility with ClevOS

Type	Model	Firmware affected
RAID Controller	Broadcom MegaRAID 9361-8i	4.650.00-6121

## Hewlett Packard

Table 29. HP Hardware and Firmware Incompatibility with ClevOS

Type	Model	Firmware affected
RAID Controller	HP-SL4540 Smart Array	6.64
iLO	HPE SL4540 Gen 8	2.30

## IBM Cloud Object Storage Appliances

Table 30. IBM COS Hardware and Firmware Incompatibility with ClevOS

Type	Model	Firmware affected
USM	IBM COS Slicestor®2584 (AP-TL-1) 3401/3403 S03	4.1.7
BMC	A3105, A4105, M3105, S2212A, S2448	1.0.125362, 1.0.135362
BMC	A10,C10,M10	< .97
CPLD	A10,C10,M10	< 1818

Table 31. IBM COS Drive Feature Hardware and Firmware Incompatibility with ClevOS

Model Affected	Feature	Capacity	Part manufacturer/model	Firmware affected
J15	AL4D	18TB	WD/WUH721818AL4200	J6Y2

**Note:** 18TB drives of model WUH721818AL4200 running J6Y2 firmware may be quarantined at elevated rates and require a device power cycle to resume. This issue is resolved in firmware version J6Y3.

## Seagate

---

*Table 32. Seagate Hardware and Firmware Incompatibility with ClevOS*

<b>Type</b>	<b>Model</b>	<b>Firmware affected</b>
HDD	Seagate ST1000NM0033-9ZM173	SN04

## Supermicro

---

*Table 33. Supermicro Hardware and Firmware Incompatibility with ClevOS*

<b>Type</b>	<b>Model</b>	<b>Firmware affected</b>
BMC	Supermicro SSG-6048R- E1CR60N	3.60

## Notices

---

This information was developed for products and services offered in the US. This material might be available from IBM in other languages. However, you may be required to own a copy of the product or product version in that language in order to access it.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing  
IBM Corporation  
North Castle Drive  
Armonk, NY 10504-1785  
U.S.A.*

For license inquiries regarding double-byte character set (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

*Intellectual Property Licensing  
Legal and Intellectual Property Law  
IBM Japan, Ltd.  
19-21, Nihonbashi-Hakozakicho, Chuo-ku  
Tokyo 103-8510, Japan*

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you provide in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

*IBM Director of Licensing  
IBM Corporation  
North Castle Drive, MD-NC119  
Armonk, NY 10504-1785*

US

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

The performance data discussed herein is presented as derived under specific operating conditions. Actual results may vary.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

All IBM prices shown are IBM's suggested retail prices, are current and are subject to change without notice. Dealer prices may vary.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

#### COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

If you are viewing this information softcopy, the photographs and color illustrations may not appear.

## Trademarks

---

IBM, the IBM logo, and [ibm.com](http://ibm.com)<sup>®</sup> are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at Copyright and trademark information at [www.ibm.com/legal/copytrade.shtml](http://www.ibm.com/legal/copytrade.shtml).

Accesser<sup>®</sup>, Cleversafe<sup>®</sup>, ClevOS<sup>™</sup>, Dispersed Storage<sup>®</sup>, dsNet<sup>®</sup>, IBM Cloud Object Storage Accesser<sup>®</sup>, IBM Cloud Object Storage Dedicated<sup>™</sup>, IBM Cloud Object Storage Insight<sup>™</sup>, IBM Cloud Object Storage Manager<sup>™</sup>, IBM Cloud Object Storage Slicestor<sup>®</sup>, IBM Cloud Object Storage Standard<sup>™</sup>, IBM Cloud Object Storage System<sup>™</sup>, IBM Cloud Object Storage Vault<sup>™</sup>, SecureSlice<sup>™</sup>, and Slicestor<sup>®</sup> are trademarks or registered trademarks of Cleversafe, an IBM Company and/or International Business Machines Corp.

Other product and service names might be trademarks of IBM or other companies.



Printed in USA