

Optimizing video surveillance solutions with IBM Cloud Object Storage, Tiger Bridge, and Milestone XProtect Corporate

A technical report

Overview

Challenge

How do you minimize the online storage requirements and realize the cost savings based on the data life cycle of the video surveillance solutions?

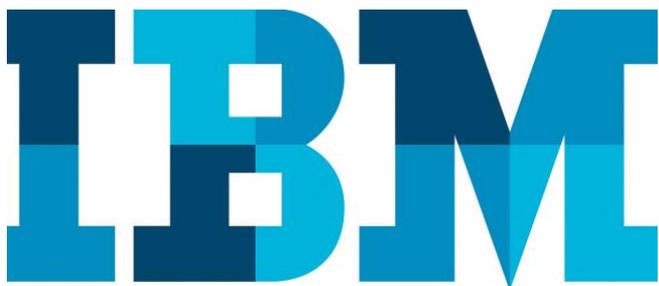
Solution

This paper provides the configuration and sizing guidelines for transparent data movement between the online storage and on-premises private or hybrid cloud storage using Tiger Bridge connector and IBM Cloud Object Storage.

The objective of this paper is to minimize the online storage requirements with transparent data tiering to the on-premises private cloud storage or hybrid cloud storage in the digital video surveillance solution. The paper covers the test strategy used and the results of the testing. This paper describes the solution architecture for deploying Milestone XProtect Corporate security solutions on IBM Cloud Object Storage with Tiger Bridge. This paper provides recommendations, and configuration and tuning adjustments to help ensure an efficient installation of the joint solution with acceptable performance that meets the needs of the organization.

The Milestone XProtect video management software is a powerful surveillance platform that is easy to manage. The configuration capabilities of the software design enable you to customize the solution to fit your requirements

IBM® system engineers thoroughly tested the solution using the system parameters outlined in this paper. This technical white paper covers the test results that describe the configuration of the Milestone XProtect Corporate server running on IBM Storwize® systems with Tiger Bridge and IBM Cloud Object Storage. It illustrates the hardware impact (on the processor, storage, and network) when changing the individual parameters of the video surveillance system, and provides recommendations on how to configure the surveillance system for optimal performance.



Storwize family summary

- Three Storwize V5000 hybrid models—IBM Storwize V5030, IBM Storwize V5020, and IBM Storwize V5010
- 2U rack-mountable chassis
- 1 Gb iSCSI, 12 Gb SAS and 16 Gb Fibre Channel or 10 Gb iSCSI/Fibre Channel over Ethernet host ports
- Small form-factor enclosure: Twenty-four 2.5-inch drives
- Large form-factor enclosure: Twelve 3.5-inch drives
- Up to 504 drives per system and up to 1,008 drives with two-way clustered systems
- Up to 2 PB per system and 4 PB with two-way clustered systems
- RAID 0, 1, 5, 6 and 10 and distributed RAID support for fault tolerance.
- 32 GB cache standard (64 GB cache optional); 128 GB with two-way clustered systems
- Redundant, hot-swappable power supplies and fans

Assumptions and prerequisites

This solution paper assumes that users are equipped with the following technology skills prerequisites:

- Proficiency in installing and configuring the Milestone XProtect Corporate.
- Familiarity with installing and configuring the IBM Storwize storage and IBM Cloud Object Storage solutions.
- Proficiency in installing and configuring the Microsoft® Windows® operating system.

The configurations documented in this paper are based on the tests conducted in the IBM internal lab. These results might differ from individual production implementations in the field.

IBM Storwize V5000 family



IBM Storwize V5000, built with IBM Spectrum Virtualize™ software, includes a highly flexible, easy to use, all-flash or hybrid storage solution that provides improved performance and enterprise support. The Storwize system includes the following features:

- Provides mid-range customers with a cost-effective, scalable storage platform that can provide advanced features typically only available to more expensive enterprise-class products
- Delivers a new, easy-to-use graphical interface to access all the features of the platform
- Provides automated tiering capabilities with the IBM System Storage Easy Tier® function, can move the frequently accessed extents to high-performing flash storage.
- Provides multiprotocol support for Fibre Channel (FC) and Internet Small Computer Systems Interface (iSCSI) attachment
- Enables replication over IP to improve network utilization for remote mirroring with innovative technology

Tiger Bridge

Tiger Bridge key features

- Runs on Windows 7, Windows 10, or Windows Server 2008/2012 R2
- Is installed as add-on software on existing file servers
- Has no impact on the server performance
- Does not need to crawl the file system to detect ongoing changes
- Works with standard NTFS file systems
- Supports native Active Directory authentication
- Is capable of full and partial retrieval
- Is optimized for high performance environments
- Is capable of restoring lost file system metadata from target
- Supports a wide variety of object-based storage, such as:
 - Native S3 protocols
 - Amazon AWS
 - DataDirect Networks WOS
 - IBM Cloud Object Storage

Tiger Bridge can minimize your online storage requirements with Transparent Data Tiering. Tiger Bridge is a secure and flexible software connector for the Windows OS that transparently replicates and moves the data from a local volume to a cloud or on-premises target—without affecting users, applications, or workflows. As such, it allows organizations to better match their storage technology with their data lifecycle in order to realize substantial cost savings

Tiger Bridge dynamically reclaims space on a fast primary server by decommissioning its stale data to a slower, more economical tier of storage. Capacity requirements for high-speed storage is therefore greatly reduced while the longevity of valuable data is increased by being stored on more appropriate, lower cost technology. Best of all, Tiger Bridge can be installed within minutes on active servers without affecting users, applications, or workflows.

Using advanced data replication and space reclaiming technology, Tiger Bridge keeps the right data at the right place at the right time. By analyzing access to files and by relying on simple policies, such as last access date, file size, and free space that should be retained on the primary server, Tiger Bridge determines when a newly created or updated file must be replicated or when a stale file must be archived. Users and applications are not affected when files are migrated from the primary server to the secondary tier, because a stub-file is created to replace the file that was moved. Stub-files are distinctive and contain all the valuable metadata information of the original file (such as size, permission, last access date, and so on) and can be accessed by users and applications similar to any other file. When a stub-file is accessed, the original file is automatically and transparently restored back to the primary server and handed to the application, just as normal. Users and applications therefore do not experience any disruption in their workflow. And because it runs directly on your Windows server and manages your existing NTFS file system, you do not need to reformat the storage, give up performance, or compromise security by going through an external gateway server. Data gets moved between your primary and secondary tiers of storage. When connecting to a target over the S3 protocol, data gets encrypted directly on the server, before it is sent to the cloud, thereby ensuring the highest level of security.

IBM Cloud Object Storage

IBM Cloud Object Storage highlights

- Scalability that offers a single storage system and namespace versus an ever-increasing number of limited-capacity storage silos
- Security features that include a wide range of capabilities designed to help meet security requirements
- Reliability and availability characteristics of the system that are configurable to best suit customer requirements
- Manageability that helps enable storage administrators to handle large storage capacity
- Flexibility of a defined storage solution that does not require specific or proprietary hardware

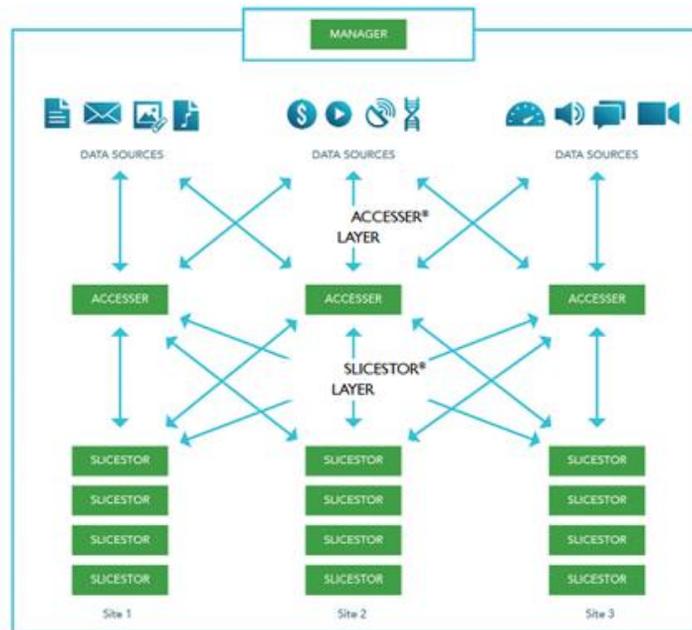


Figure 1: IBM Cloud Object Storage System

The IBM Cloud Object Storage System™ uses an innovative approach for cost-effectively storing large volumes of unstructured data while helping ensure security, availability, and reliability. IBM Cloud Object Storage technology uses Information Dispersal Algorithms (IDAs) to separate data into unrecognizable *slices* that are distributed through network connections to storage nodes locally or across the world. The collection of distributed storage appliances creates what is called an IBM Cloud Object Storage System. With IBM Cloud Object Storage dispersed storage technology, transmission and storage of data are inherently private and secure. No complete copy of the data resides in any single storage node, and only a subset of nodes needs to be available in order to fully retrieve the data on the network.

The IBM Cloud Object Storage System enables the creation of storage systems using three software components – the IBM Cloud Object Storage Manager, IBM Cloud Object Storage Accesser and IBM Cloud Object Storage Slicestor. These software components can be deployed on a wide range of compatible industry-standard hardware platforms, as virtual machines, and in the case of the IBM Cloud Object Storage Accesser, as an application running on a Linux® OS. Physical and virtual deployment can be combined in a single system, for example, virtual machines for the IBM Cloud Object Storage Manager and the IBM Cloud Object Storage Accesser and physical servers for the IBM Cloud Object Storage Slicestor.

Key lab components

- IBM Storwize V5030
 - Tiger Bridge
 - IBM Cloud Object Storage
 - Milestone XProtect Corporate 2016
 - Brocade Fibre Channel switch
 - VMware ESX hypervisor
 - 10 Gb Ethernet switch
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Each of the following three software components serves a specific function as a part of IBM Cloud Object Storage:

- The IBM Cloud Object Storage Manager is responsible for monitoring the health and performance of the system, configuring the system and provisioning storage, managing faults, and other administrative and operational functions.
- The IBM Cloud Object Storage Accesser is responsible for encrypting or encoding data on ingest and decoding or decrypting data when read as well as managing the dispersal of data slices resulting from this process across a set of IBM Cloud Object Storage Slicestor nodes.
- The IBM Cloud Object Storage Slicestor is responsible for the storage of data slices.

IBM Cloud Object Storage delivers the following features and benefits:

- **Availability:** Data is always available—whether or not there is planned or unplanned downtime.
- **Scalability:** Systems are easily able to grow from terabytes to petabytes to exabytes.
- **Security:** Data confidentiality is maintained even when multiple drives, servers, containers, or locations are compromised.
- **Economics:** The need for costly replication is eliminated, significantly lowering the total cost of ownership for storage systems at the petabyte level and beyond.
- **Efficiency:** More easily manage tens of petabytes of storage per administrator.

Solution key components

This section provides details about the components used in the solution.

Milestone XProtect Corporate

Video management system (VMS) is a key component of a video surveillance solution that collects video data from the cameras and other data sources.

Milestone XProtect Corporate is a leading open platform software designed to meet the highest security demands of large enterprise customers.

- XProtect Corporate management server is the central component of the VMS and is responsible for handling the system configuration, distributing configuration to other system components (such as recording servers), and for facilitating user authentication. The configuration data is stored in a standard Microsoft SQL server installed either on the management server itself or on a separate dedicated server. Management server provides an ability to manage geographically dispersed sites easily from a central location.
- XProtect recording server records and stores video, audio, and metadata, and provides operators and other users access to live and recorded streams. It receives the incoming camera data and stores the video content to the

storage system.

- XProtect Smart Wall is an advanced video wall solution included with the software. It enables control room operators to share a wide range of information, including live and recorded video, images, maps, alarms, and text messages to better coordinate response activities.
- XProtect Smart Client is a primary user interface for security operators and other daily users. Its adaptable user interface provides an extremely efficient working environment that can be optimized for different tasks and operator requirements.

Server platform

Server platform plays a key role in video surveillance architecture. When designing and deploying large-scale VMS systems, Milestone recommends that you base the server design and implementation on virtualization technologies such as VMware vSphere. Virtualization technology offers a range of benefits when used in standard IT installations. Hypervisors such as VMware helps to host multiple servers on one physical server depending on the processor and memory resources.

Storage system

Storage system is the critical component in the surveillance system for storing video content. Simplicity, scalability, and affordability are the important considerations for storing huge volume of video archives. IBM Storwize system provides a cost-effective platform for online storage. Tiger Bridge provides a secure and flexible connector for transparent data movement between online IBM Storwize systems and the on-premises private or hybrid IBM Cloud Object Storage System. This architecture allows organizations to place the data on the appropriate storage tier based on the data lifecycle and helps in reducing the storage cost.

Networking

The recommendations include: 10 Gb Ethernet connectivity between the server platform, an incoming camera network, and Milestone systems.

Lab validation configuration

The following hardware was used in the lab for validating the functionality and sizing information for the IP video surveillance solution using IBM Storwize system.

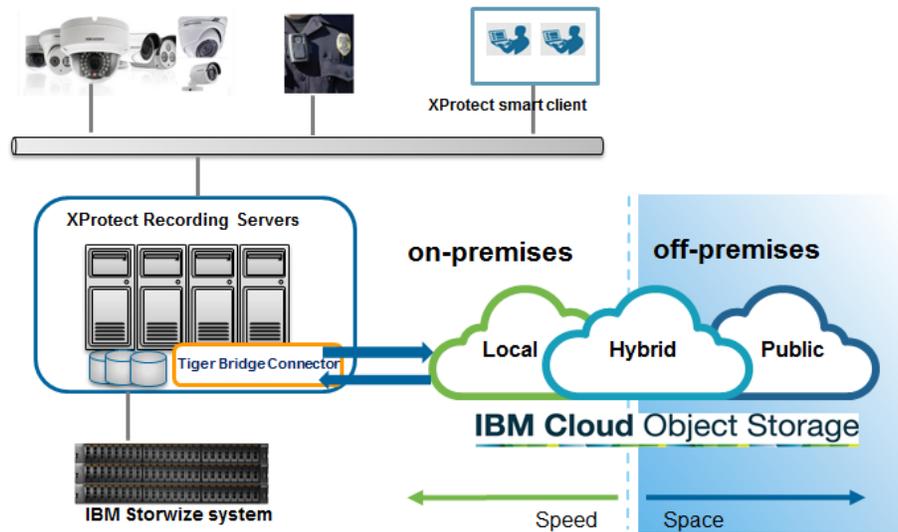


Figure 2: Milestone XProtect Corporate high-level architecture with IBM Cloud Object Storage

No.	Role	Configuration
1	Milestone XProtect management server	Two processor cores, 8 GB memory, Windows 2012 R2, Milestone XProtect 2016 Management suite.
2	Milestone XProtect recording servers	Four to six processor cores, 32 GB memory, two 10 Gb Ethernet, Windows 2012 R2, XProtect Corporate recording server. Tiger Bridge connector was installed for the transparent data movement between IBM Storwize and IBM Cloud Object Storage System.
3	Camera simulator	One processor core, 8 GB memory, 10 Gb Ethernet, Windows 2012 R2. StableFPS camera simulators were used to simulate the camera data. Each simulator server is configured with 150 cameras.
4	Storage unit	IBM Storwize V5030 system was used for the online storage and IBM Cloud Object Storage configured as the archiving storage for the longer retention purpose.

5	Cloud storage	IBM Cloud Object Storage System with one Manger device, three Accesser devices, and nine Slicestor devices. It was configured with 1.7 PB raw capacity.
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Table 1: Lab configuration details

Testing and lab validation

Various tests were conducted in the lab with the focus on the storage-related factors for video archiving. A controlled environment was used for testing by adjusting the camera settings, and quantity of simulated cameras while monitoring key performance metrics for write latency, processor consumption, network utilization, and video frame loss. The Milestone StableFPS simulation utility was used to simulate the cameras. Tests were performed for more than seven days to accumulate the data and simulate an environment similar to the production environment. Through the Milestone StableFPS simulation utility, the camera count was set at 150 cameras per recording server and ran for seven days, without loss of frame data.

The test procedure includes the following steps:

1. Configure the IBM Storwize V5030 system as the video storage.



Figure 3: IBM Storwize V5000 login page

2. Configure the RAID 5 SAS volumes from the IBM Storwize system as the live recording storage on the recording server.
3. Configure the RAID 6 NL-SAS storage volumes from the IBM Storwize system as the archiving storage on the recording server.

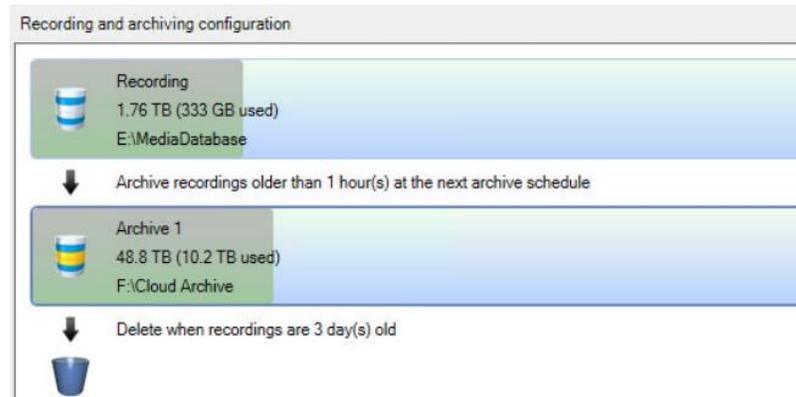


Figure 4: Milestone recording server storage configuration

4. Configure the StableFPS cameras as the simulating cameras on the recording server.

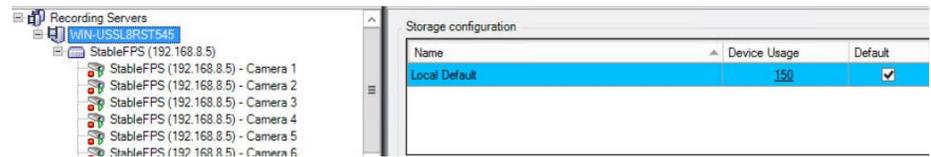


Figure 5: Milestone recording server camera configuration

5. Adjust the camera settings for the HD resolution and continuous recording purpose.

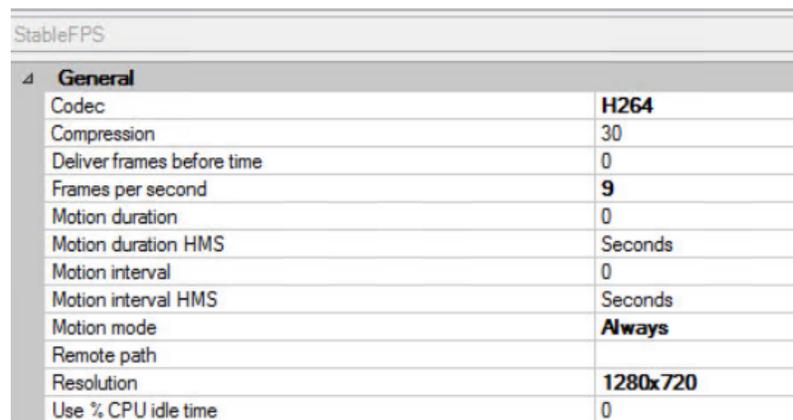


Figure 6: StableFPS camera unit configuration

6. Install and configure the Tiger Bridge connector software on the Milestone recording server for transparent data movement between online storage and cloud storage.
7. Create a vault on the IBM Cloud Object Storage for archiving the content from the Milestone recording server to the cloud storage.

Vault: Tiger_Vault

General

Name: **Tiger_Vault**
Storage Pool: [ISVSP1](#)
Creation Date: 2016-12-12 04:33:22 MST
UUID: afa5c7c1-7350-40fe-b685-eaffe45d1d87

Configuration

Width: 9
Threshold: 5
Write Threshold: 7
Alert Level: 8
Segment Size: 4.19 MB

Additional Features

SecureSlice Technology: Disabled
Versioning: Disabled
Delete Restricted: No
Name Index: Enabled
Recovery Listing: Disabled

Figure 7: Vault configuration on IBM Cloud Object Storage

8. Create a user and assign the ownership to the vault created in the previous step on the IBM Cloud Object Storage.

Account: Tiger

General

Name: Tiger
Organization: ISV
Email: (unset)
Timezone: Using manager timezone (United States - Mountain Time - Arizona)
UUID: cc85514d-28b1-4574-a9cb-810ef7c59273
Enabled: Yes

Authentication

Username: tiger
Password: *** not displayed ***

Access Key Authentication

Created	Access Key ID	Secret Access Key
2016-12-12 04:35:46 MST	DN8y9Ad7RVG9Itd04jLFB	Click to Show Secret Access Key

Roles

Role	Description
Super User	Perform any action within the Cloud Object Storage Manager except vault read/write.

Vault Access

Owner (2) | Read/Write (0) | Read-Only (0) | No Access (7)

- Tiger_Genetec
- Tiger_Vault

Figure 8: User configuration on IBM Cloud Object Storage

9. Configure the IP address of the IBM Cloud Object Storage, vault location details, and user credentials, created in the previous steps for the Tiger Bridge configuration parameters on the Milestone recording server.

Test procedure and observations

To validate the transparent data movement between the IBM Storwize system and IBM Cloud Object Storage, various test cases were simulated in the lab to check the sustained throughput under all archiving conditions.

Camera video quality settings include:

- Resolution: H.264 1280x1024
- Frames per second: 9
- Recording frames: All

Tiger Bridge connector was configured to move all the video files except the latest one to the IBM Cloud Object Storage. This can be verified by browsing the files in the explorer on the Windows server.

After camera ingesting ran for a period of 24 hours, the test team logged into the smart client application to request playback streams continuously from the archived storage.

The play procedure includes the following steps:

1. Open a 24-camera view in the smart client application for the playback.
2. Use the timeline selector to select the last four hour of video.
3. Increase the playback speed for forward and backward movement.
4. Click **Play**.

The video playback time must span for couple hours of the data that resides in the archiver and needs to be adjusted during the playback streams.

During the 5-day test, up to 150 cameras were simulated with h.264, 9 frames per second, continuous recording or motion detection capabilities.

Storage unit space from the IBM Storwize has been configured for the live and archiving recording purpose. Milestone scheduler is configured to move every hour the data from the live recording space to the archiving storage space. Tiger Bridge was configured to move all the video archived files from the archived location of the Milestone storage unit to the IBM Cloud Object Storage. For the lab testing purpose, it has been configured to move all the contents from the archive storage unit to the IBM Cloud Object Storage. However, in the production environment, you can configure the Tiger Bridge system to move the content based on your organization requirements. The playback tests ran in the continuous loop mode to measure the throughput of Tiger Bridge connector and IBM Cloud Object Storage video unit when the archiver is deleting the oldest video file. No video frame loss was noticed during these extended testing in the lab.

Based on the 150-camera lab test results with no data lost, the IBM Storwize V5030, Tiger Bridge Connector, and IBM Cloud Object Storage System can provide a simple and very cost-effective video surveillance solution. It is recommended to start with a 150-camera count as the base configuration and monitor the parameters before adding the additional cameras, without the risk of losing data.

All video content was received through the 10 Gb interface on the recording server. During the performance run, the 10 Gb adapter operated at a very low utilization. In a moderate camera count environment, binding multiple 1 Gb adapters might be effective, but this was not tested.

Storage system was connected using dual 16 GB FC connections with multi-pathing software. During the performance run, the 16 GB FC utilization was low and 8 GB FC might work for the moderate camera count environment. No solid-state drives (SSD) or IBM Easy Tier optimization was considered. This is because the data footprint is a write-once, read-never scenario and does not receive any benefit from an SSD architecture.

Summary

IBM has performed extensive testing with Milestone XProtect Corporate, Tiger Bridge from the Tiger Technology, IBM Cloud Object Storage, and IBM Storwize family. Depending on your requirements, IBM storage system architecture allow an extremely cost effective scalable solution from few hundreds to thousands of cameras.

The solution includes the following key benefits:

Easy to use – The IBM Storwize platform is easy to use, proven in operation, and scales to support your requirements. Tiger Bridge is a simple-to-use connector with minimal configuration, which moves the data transparently between online to cloud storage. It simplifies the administration by consolidating online storage and with long-term archiving Cloud Object Storage into a single system.

Best in class – This solution provides *best-in-class* and extreme scalable video solutions to enable your business, reduce costs, optimize processes, protect assets, and ultimately increase value in your organization's products and services.

Solution partnership – By combining the innovative from Milestone Systems and Tiger Technology with a market-leading IBM Storwize platform and IBM Cloud Object Storage, you can provide a comfortable solution that can provide best-in-class performance and value. The partnership also ensures that a solution investment can provide value for many years to come with the opportunity to upgrade as required while protecting the legacy investment in technology.

Acknowledgments

Special thanks to the Tiger Technology product management and engineering teams in Europe for loaning the software and licenses that enabled the IBM engineering teams to successfully create an operational test environment and run tests to document the results.

Resources

The following links provide the useful references to supplement the information contained in this paper:

- Milestone system documentation
<https://www.milestonesys.com/>
- Tiger Technologies
<http://www.tiger-technology.com/>
- IBM Systems on PartnerWorld
ibm.com/partnerworld/systems
- IBM Redbooks
ibm.com/redbooks
- IBM Publications Center
ibm.com/e-business/linkweb/publications/servlet/pbi.wss?CTY=US

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