

Dell EMC Surveillance for VIEVU Body-Worn Cameras

Functional Validation Guide

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Dell EMC

Surveillance Lab

Tested

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CHAPTER 1

Introduction

This functional verification guide provides compatibility guidelines for Dell EMC storage arrays and storage clusters.

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Solution overview

The use of body-worn cameras in law enforcement is expanding globally. As law enforcement agencies grapple with the additional workload and realize the impact related to their IT infrastructures, it is critical that they procure validated solutions that address the underlying system requirements. Dell EMC's approach to addressing body camera system requirements provides an open and flexible architecture for several storage strategies relevant to the body-worn camera dataflow and workload.

The solution meets the system requirements related to traditional on-premises storage (VNX, VNX-VSS, and Isilon), object store on-premises (Isilon Swift), private cloud storage (Elastic Cloud Storage, CloudArray), and hybrid cloud storage (CloudArray, Dell EMC Cloud Service Providers). Customers can deploy each option independently or in combination to meet a broad scope of storage requirements and ultimately deliver an infrastructure strategy that meets their immediate needs and can scale to accommodate future requirements.

Purpose and scope

This guide is intended for use by internal Dell EMC sales and pre-sales personnel, and qualified Dell EMC and VIEVU partners.

This guide provides results from a functional test that we conducted to ensure the compatibility of VIEVU cameras with Dell EMC storage. The test does not establish sizing guidelines.

This guide provides functional information regarding VIEVU using the following storage solutions:

- Dell EMC Isilon™
- EMC VNX™ and EMC VNX-VSS (Video Surveillance Storage)
- Dell EMC CloudArray™ with Dell EMC Elastic Cloud Storage™ (ECS™)
- Dell EMC CloudArray with Dell EMC Isilon Swift

CHAPTER 2

Solution components

This chapter provides information about the components configured in this solution.

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VIEVU cameras

VIEVU cameras are built tough for law enforcement, tactical and military use. VIEVU body worn video cameras are easy to wear and use. Use VIEVU to record hands-free video & audio from your point of view.

The following list describes the primary VIEVU cameras:

LE3

- A leading police body worn video camera deployed by over 4000 agencies in 16 countries.
- LE3 features include HD video resolution, 16GB internal memory and up to 12 hours of record time.
- Video from the LE3 camera is securely stored in the cloud or on-site using VIEVU's proprietary software.
- A FIPS 140-2 compliant digital signature process is used to verify the video has not been altered.

VIEVU²

- A feature-rich, small form factor wearable video camera that is hands free, rugged, and waterproof.
- It streams and stores real time video to your iPhone or Android smartphone without the need for a cable.
- Once videos are on your phone, you can edit and upload them to Facebook, Twitter, and YouTube or email, text and store them in your DropBox folder.
- VIEVU² eliminates the need to transfer videos later.

The VIEVU cameras support the following resolutions:

- 1280 x 720
- 848 x 480

VERIPATROL

VERIPATROL is an on-site video management system for VIEVU LE cameras. VERIPATROL includes several layers of security to keep your data secure and utilizes a FIPS 140-2 compliant Digital Signature process to prove that video has not been altered. VERIPATROL is fully network capable and can support deployments of all sizes. The video from the VIEVU camera is categorized and stored to a Dell EMC storage solution using VERIPATROL.

Dell EMC Elastic Cloud Storage (ECS)

ECS is a complete software-defined cloud storage platform that supports the storage, manipulation, and analysis of video surveillance and unstructured data on a massive scale on commodity hardware. ECS is specifically designed to support the mobile, cloud, and Big Data workloads that are similar to large-scale workloads.

ECS provides GUI, RESTful API, and CLI interfaces for provisioning, managing, and monitoring storage resources. Storage services provided by the unstructured storage

engine (USE) ensure that video is available and protected against data corruption, hardware failures, and data center disasters. The USE enables global namespace management and replication across geographically dispersed data centers and enables the following storage services:

Object service

Lets you store, access, and manipulate video and unstructured data. The object service is compatible with existing Amazon S3, Centera™ content addressable storage (CAS), and Atmos™ APIs.

Hadoop Distributed File System (HDFS)

Helps you use your ECS infrastructure as a big data repository that you can run Hadoop analytic applications against (in place).

The provisioning service manages the provisioning of video surveillance storage resources and user access. Specifically, it handles user management, authorization, and authentication for all provisioning requests, resource management, and multitenancy.

You can scale up, scale out, and add users, applications, and services, as well as manage your local and distributed storage resources for your surveillance data through a single view.

Dell EMC CloudArray

CloudArray provides cloud-integrated storage that extends high-performance storage arrays with cost-effective cloud capacity. CloudArray technology simplifies storage management for video files and provides on premises and off premises protection by providing access to a private or public cloud storage tier through standard interfaces (iSCSI, NAS).

CloudArray takes advantage of local storage, also known as cache, which serves two purposes. The first is to provide local performance for file ingest, which often eliminates the effects of cloud latency. The second is to serve as a buffer for read/write operations.

CloudArray is offered as both a physical appliance and a virtual appliance that can be deployed either on site or in a cloud compute environment. CloudArray uses cache storage for performance acceleration. User-defined policies dictate how much data is kept in the local cache. CloudArray can manage multiple policies and caches simultaneously, each of which can be individually configured to support the needs of the different application workloads.

The physical appliance is a dedicated server that comes with built-in CloudArray software. The size of the hardware appliance determines the total amount of local cache available. The appliance's storage can be carved into multiple, smaller caches to provide greater granularity and flexibility. In a CloudArray physical appliance, the total amount of cache available is predetermined based on the hardware configuration.

In a virtual appliance, the cache can be any local storage accessible by the CloudArray software. A CloudArray virtual appliance can be mapped to multiple different storage types based on requirements. For example, a CloudArray virtual appliance can be mapped to solid-state drives (SSDs) for a cache associated with high-performance or production systems and to SATA drives for archive or other data with lower performance and availability requirements.

EMC VNX and EMC VNX-VSS storage platforms

The VNX-VSS series is a purpose-built block storage system solution for the video surveillance workload that brings storage reliability, simplicity, and affordability to the distributed environments on your video surveillance network.

The VNX and VNX-VSS series can be used to address both distributed and large-scale centralized surveillance needs where block-only (iSCSI, Fibre Channel) connectivity is required. For applications that support block-only connectivity, the VNX series of storage arrays can scale to multiple petabytes for large-scale centralized deployments.

The VNX series is ideal for surveillance data that requires enhanced storage capabilities and is designed for a wide range of environments from mid-tier through enterprise. The VNX series includes offerings with file-only, block-only, and unified (block and file) implementations.

Both the VNX and VNX-VSS series systems are managed through Unisphere™, which is a simple and intuitive user interface that integrates information from varied sources across multiple applications and environments into a single display.

Dell EMC Isilon clustered storage system

Isilon scale-out network-attached storage (NAS) was designed and developed specifically to address the needs of storing, managing, and accessing digital content and unstructured data such as surveillance video. An Isilon cluster provides simple dynamic scaling to increase or decrease the total capacity of the Isilon cluster.

An Isilon clustered storage system is composed of multiple nodes. These nodes are integrated with the Isilon OneFS™ operating system, which is a distributed network file system that unifies a cluster of nodes into a single shared resource.

The single namespace across the multinode cluster enables equal access to video files no matter which node is currently connected. Isilon SmartConnect™ provides load balancing across the cluster nodes to ensure the even distribution of video files.

CHAPTER 3

Solution configuration

This chapter provides information about the components configured in this solution.

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Body-worn camera storage architecture

Surveillance data can consume vast amounts of storage while still requiring access to both live and archived video. The demand for surveillance storage is increasing due to higher camera resolutions, increased numbers of deployed cameras, and extended retention times for the video. These factors are forcing the need for greater storage performance and scale.

VNX and VNX-VSS provide high-performance and fault-tolerant storage options for video storage data. Isilon provides file or local object stores in highly expandable storage options that meet the current and future needs for surveillance data. Both Isilon and VNX/VNX-VSS options provide partners and customers the benefit of locally secured video storage.

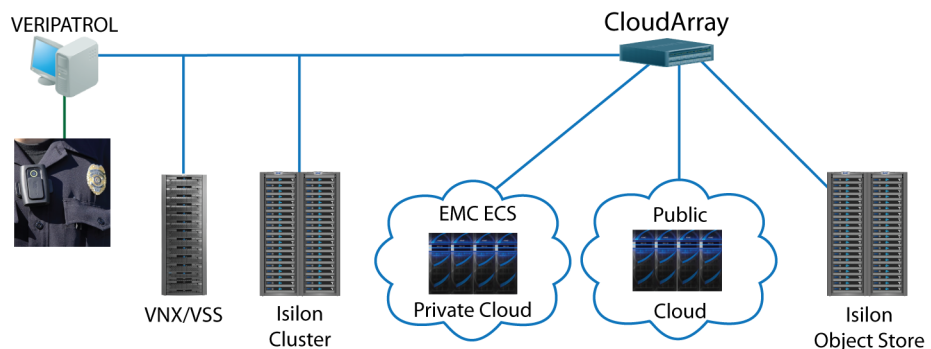
ECS enabled with CloudArray provides a cost-effective means to meet the current and future needs for surveillance data. By deploying CloudArray, partners and customers can receive the benefits of private or hybrid cloud storage without needing to integrate directly with the cloud storage platform.

In the case of body-worn cameras, public safety organizations and the public safety quadrants within corporate environments have unexpected exponential requirements for storage that is dedicated to body-worn camera video. This expansion can be due to a number of factors including:

- New deployment of body-worn cameras
- Expansion of existing body-worn camera deployment
- Higher body-worn camera resolution and/or frame rate
- Increased retention period to meet compliance related to legal proceedings and governmental retention policies

The following figure shows connectivity options.

Figure 1 Overview of connectivity options



VNX/VNX-VSS architecture

Dell EMC Surveillance Labs continually test video management systems (VMS) from multiple body camera vendors to ensure compatibility with Dell EMC local storage systems and CloudArray on multiple private and public cloud services.

The data flow from the camera to either a VNX or VNX-VSS starts when the body camera transfers its video to a workstation running a video server.

The Dell EMC Surveillance Labs also functionally validated that body camera video files can be stored to an iSCSI-attached VNX or VNX-VSS storage array. After the

video is copied to the array, a video server can be used to review video and manage archived video based on preset retention policies.

Body camera connectivity options

Body-worn devices can be configured using different Dell EMC storage systems, such as VNX/VSS, Isilon, and CloudArray.

VNX and VSS (iSCSI)

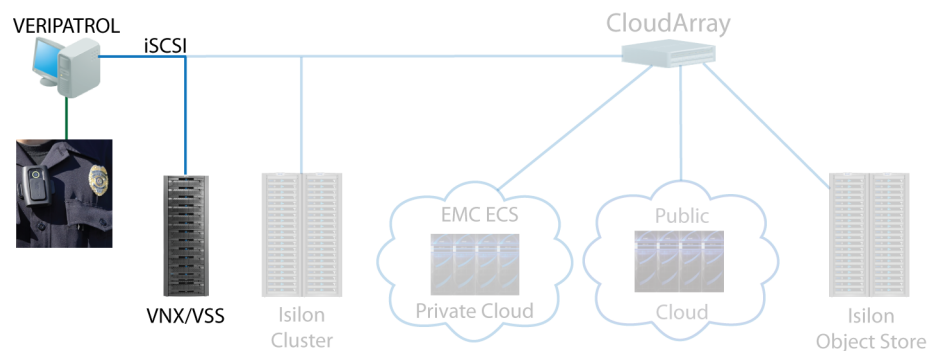
A video server is attached to VNX or VSS storage using an iSCSI initiator. The video server ingests video files from the body camera client that is stored on VNX/VSS storage.

Isilon share (CIFS)

The video server mounted shares are created on the Isilon scale-out storage cluster. The video server ingests video files from the body camera client that is stored on the Isilon cluster. Depending on the capabilities of the body camera application, the Isilon shares can be mounted via the Server Message Block (SMB) Protocol or NFS.

The following figure shows a body camera configuration where a video server stores the video to the VNX or VSS array via an iSCSI connection.

Figure 2 VNX/VSS body camera architecture



Isilon architecture

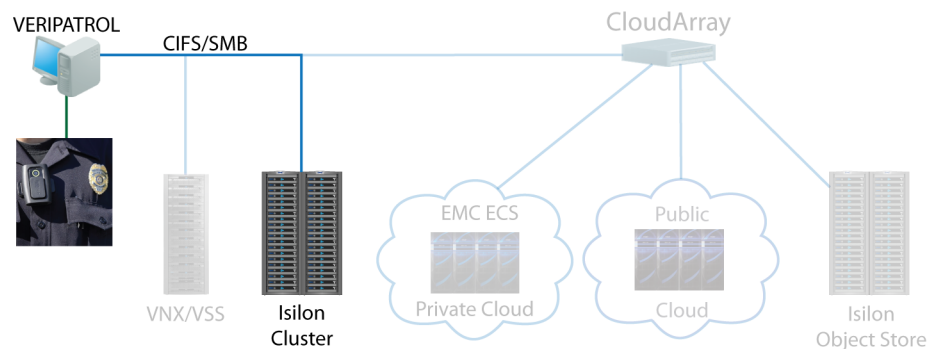
The data flow from the camera to an Isilon server starts when the VIEVU camera transfers its video to the workstation that is running VERIPATROL.

The Dell EMC Surveillance Lab also functionally validated that the VIEVU video files can be stored to an SMB attached Isilon scale-out storage device. After the video is copied to the cluster, VERIPATROL can be used to review and manage archived video based on preset retention policies.

An Isilon cluster provides simple dynamic scaling to increase or decrease the total capacity of the cluster, which can determine the amount of storage available to VERIPATROL.

The Isilon OneFS operating system provides a single namespace across the multi-node cluster. This single namespace design enables equal access to the files no matter which node VERIPATROL is connected to. Isilon SmartConnect provides the ability to load balance across the nodes of the cluster.

The following image shows a body camera configuration in which VERIPATROL stores the video to Isilon through a SMB or iSCSI connection.

Figure 3 Isilon body camera architecture

CloudArray architecture

The Dell EMC Surveillance Lab tested both ECS and Isilon Swift object storage enabled by CloudArray, which enables the video server to use both Private Cloud (ECS) and basic object storage via Isilon Swift.

CloudArray enables the use of multiple cloud service providers for basic object storage that are compatible with CloudArray without the need for direct integration. We also tested hybrid cloud functionality on the following platforms using CloudArray with a Dell EMC cloud service provider over a public network:

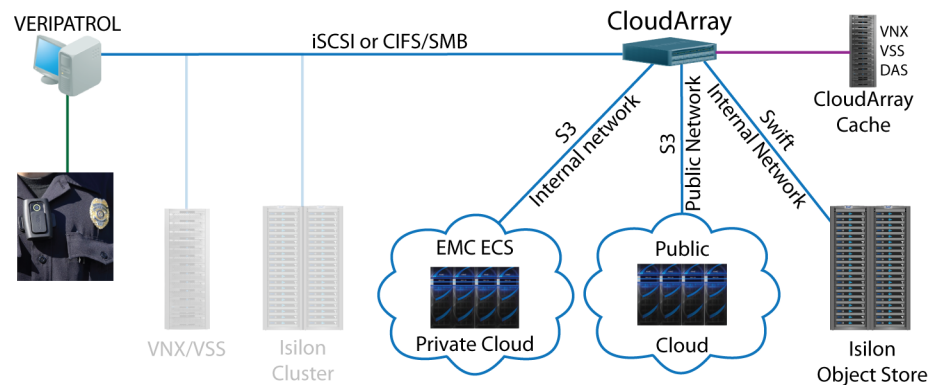
- ECS (private cloud)
- Isilon Swift (private object storage)
- AT&T Cloud Object Store (hybrid cloud)

The video server can be connected to CloudArray using iSCSI or Common Internet File System (CIFS) protocols. Body camera video is ingested and is stored to CloudArray and then CloudArray in turn seamlessly handles the write, read, and delete operations to the object store related to normal end-user and application activity.

The data flow from the camera to either a private cloud or a public cloud starts with the body camera transferring its video to a workstation or server, typically through a client or application agent.

The video server mounted shares are created on the Isilon scale-out storage cluster, and the video server ingests video files from the body camera client that is stored on the Isilon cluster. Depending on the capabilities of the body camera application, the Isilon shares can be mounted via CIFS (SMB) or NFS.

The following image shows a body camera configuration where VERIPATROL stores the video to the Isilon storage cluster through an OpenStack Swift connection.

Figure 4 Local object store, private cloud, and public cloud via CloudArray

CloudArray Cache

CloudArray uses a local cache called CloudArray Cache. CloudArray Cache is either direct attached storage (DAS), an iSCSI-attached VNX/VSS, or an Isilon cluster.

When a video server writes to the CloudArray, it first writes to cache and marks the file as a dirty page. A dirty page is an indicator that the video file resides only on the cache and has not been copied to cloud storage, but that it will be copied to cloud storage based on a least recently used (LRU) algorithm. This LRU approach ensures that any video that must be reviewed immediately is available locally, thus avoiding file transfers from the cloud. The LRU method minimizes the network utilization and latency related to cloud retrieval when video is viewed, and ultimately improves the end-user experience.

The video is then copied to ECS or public cloud storage that supports the API protocol, such as S3, which is compatible with AT&T Cloud Storage. After the video is copied to the cloud's object store, the video exists simultaneously on the cache and the object store, and the dirty page indicator is removed. CloudArray eventually purges the cached version of the video. Although CloudArray works on the block level, conceptually the video file purge occurs when CloudArray Cache is nearly full. Video selected for removal is the oldest video based on when it was last accessed.

Note

The Dell EMC Surveillance Lab used the Amazon S3 protocol to test this solution. The lab also functionally validated that based video files and unstructured surveillance data for evidence management can be stored to AT&T Cloud Storage.

The size of the cache is based on implementation requirements and cache retention considerations including the rate of file ingest, frequency of video recall, and private cloud or public cloud connectivity. We recommend a cache of 12 TB or greater so that it is sufficient to accommodate the timeframe that encompasses 95 percent of the expected video reviews.

When video is recalled for review, it is read directly from the cache. If the cached copy was removed, the video is recalled from cloud storage and again placed on the cache. Once the video is recalled from the object store to the cache, it resides on the cache as if it was newly accessed.

CHAPTER 4

Testing and validation

This chapter describes the testing used to validate this solution.

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Test summary

The functional test determined that VERIPATROL was used to successfully review the video from the VIEVU camera using Dell EMC storage solutions. For more information about server sizing guidelines, refer to VIEVU system specifications.

The following Dell EMC storage solutions were tested:

- Dell EMC Isilon
- EMC VNX and EMC VNX-VSS
- Dell EMC CloudArray to Dell EMC Elastic Cloud Storage (ECS)
- Dell EMC CloudArray to Dell EMC Isilon Swift

The VIEVU cameras create a file for every 0.99 GB of video data. There are two supported resolutions for video file creation. The details of the two resolutions are as follows:

1280 x 720 resolution

FPS: 30

Camera usable space: 14.7 GB usable

11 files in one charge with 10 file of 0.99 GB and the 11th file of 884 MB

Duration of video data in each file: 24 min, 26 sec

Camera storage usage: 3.84 GB free, 10.8 GB used

File format: .MP4

Video Encoding format: H264

848 x 480 resolution

FPS: 30

Camera usable space: 14.7 GB usable

Six files in one charge with five files of 0.99 GB, and the 6th file of 580 MB

Duration of video data in each file: 52 min, 19 sec

Camera storage usage: 9.14 GB free, 5.56 GB used

File format: .MP4

Video Encoding format: H264

With CloudArray, we tested playback with the video coming from the CloudArray cache and then from the object store. When reading video from the Object Store the video is brought first to the Cache and then the CloudArray serves that video to the requester. There is no meaningful difference in recall time between reading from cache and reading from the Object Store on a local private cloud.

Our testing discovered no appreciable differences in latency when retrieving video from the CloudArray Cache as compared to retrieving video from ECS or Isilon Swift on a private cloud on our lab network.

Testing for the public cloud scenario has provided longer video recall times from the private cloud, but recall times may vary within a public cloud. The design of public cloud architecture includes too many factors to derive a video recall time that can be universally applied.

The VERIPATROL retention time feature was successfully tested on all storage options and testing scenarios including local storage, private cloud storage, local object storage, and hybrid cloud storage.

NOTICE

The information in this guide should be used only as a compatibility guide and not as a performance baseline for sizing purposes.
