Surveillance
Dell EMC Storage with Godrej IQ Vision Ultimate

Sizing Guide

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CHAPTER 1

Introduction

This chapter provides information on the purpose and scope of this solution:

Solution overview

Godrej IQ Vision Ultimate is a tiered solution that works well with Dell EMC Unity™ or EMC VNX™ family storage arrays. The first tier of storage, Live DB, can accommodate stored video for the retention period prior to being moved to the second tier, of storage, Archive DB or deleted. The best practice retention time is between 2 and 24 hours. The second storage tier is Archive DB, which can accommodate long video retention cycles prior to being deleted from the second tier of storage.

Live DB requires block storage, such as Dell EMC Unity or EMC VNX family arrays using iSCSI or Fibre Channel (FC), or storage local to the server. In a virtualized environment, the Unity or VNX family arrays can serve a dual purpose by providing storage for the LiveDB and VMware datastores. The Archive DB used as the secondary storage for video and surveillance data can be stored on a unique Unity or VNX family array.

While the Godrej IQ Vision Ultimate tiered storage solution can be deployed within a site, depending on the requirements IQ Vision Ultimate can also provide a solution for distributed to central site architectures.

Purpose

This guide provides guidelines for sizing the Dell EMC storage arrays and storage clusters. The sizing recommendations are based on performance and storage protocol conclusions derived from Dell EMC testing.

Scope

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

The guidelines presented are for storage platform positioning and system sizing. The sizing recommendations are based on performance and storage protocol conclusions derived from Dell EMC testing.

The guidelines for sizing this video storage solution describe the use of the following storage platforms:

- Dell EMC Unity™
- EMC VNX™
- EMC VNXe™
- EMC VSS™

These guidelines include the following design considerations:

- Architectural overview of Godrej IQ Vision Ultimate
- Dell EMC storage considerations for Godrej IQ Vision Ultimate
- Result summaries for the tests carried out by Dell EMC engineers in a VMware ESXi virtualized infrastructure

Use this guide to determine the best configuration for the following:

- Number of Godrej Recorders
- Storage using Fibre Channel (FC) and Internet SCSI (iSCSI) on VNX systems

- Load factors related to the use of Dell EMC storage arrays in the customer's solution

Note

All performance data contained in this report was obtained in a rigorously controlled environment. Network topology and system environment variables can have significant impact on performance and stability. Follow the best practices as outlined in the *Dell EMC Storage with Godrej IQ Vision Ultimate: Configuration Guide* regarding network and storage array configuration. Server and network hardware can also affect performance. Performance varies depending on the specific hardware and software, and might be different from what is outlined here. Performance results will be similar if your environment uses similar hardware and network topology.

Key objectives

The configurations documented in this guide are based on tests conducted in the Dell EMC Surveillance Lab and actual production implementations.

These are the key objectives of this solution:

- Measure the sizing needs for specific system requirements so that an implementation can be correctly sized and the appropriate Dell EMC products can be matched to a customer's requirements.
- Determine the VNX, VNXe, and VSS LUN bandwidth within the storage pool.
- Calculate array maximum bandwidths.
- Recommend disk drive types.
- Confirm the previous test results with lab controlled failures, such as disabled storage processors, disk rebuilds, and network path failures.

CHAPTER 2

Solution components

This chapter provides information about storage options for video and audio data:

Dell EMC storage

Dell EMC storage arrays are ideal for storing video and audio data.

This guide describes the tests for the following storage arrays:

- Unity arrays
- VNX arrays
- VNXe arrays
- VSS arrays

For our testing, we used both single and dual storage processors for the full range of VNX, VNXe, and VSS storage arrays.

Storage protocols

Dell EMC uses standard file protocols to enable users and applications to access data that is consolidated on a Dell EMC storage solution.

This guide provides information about these network protocols:

- FC
- iSCSI

Godrej IQ Vision Ultimate architecture

Godrej IQ Vision Ultimate 2016 uses a distributed architecture with a management server as the core server. The management server can be centrally located or distributed to multiple sites and connected using the Godrej Federated Architecture. The number of recording servers is unlimited.

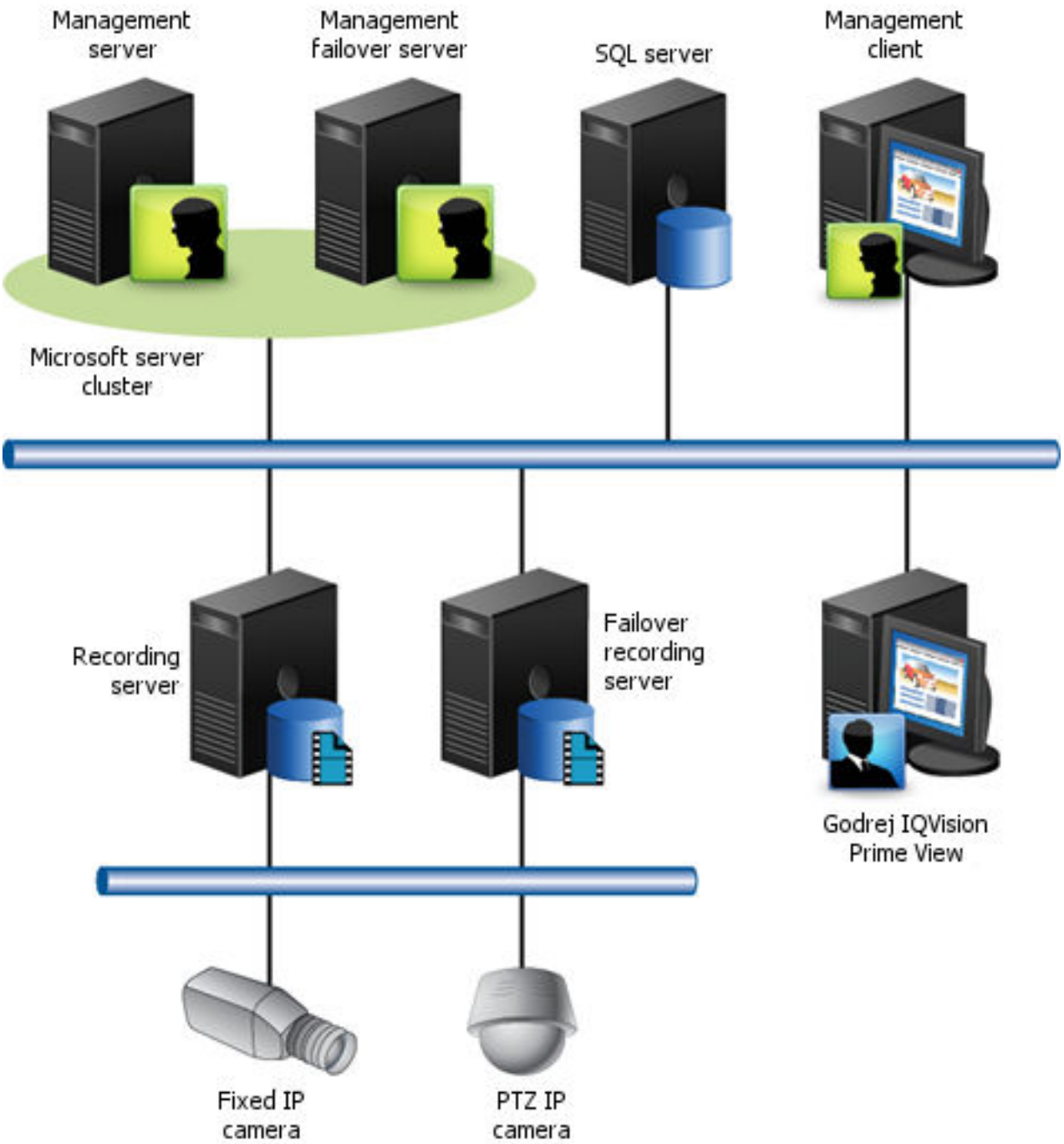
The following table lists IQ Vision servers, services, and their functions.

IQ Vision Ultimate Server/Service	Functions
Prime View	Full-featured remote client, which provides these daily functions: • Simultaneous live view and playback of 100 cameras • Intelligent Pan Tilt Zoom (PTZ) camera control • Advanced search capabilities • Export of evidence material
Remote Client	Provides live view and playback of up to 16 cameras and performs most daily operations
Matrix	Allows up to four live video streams to be sent to an IQ Vision Ultimate Prime View PC
Recording/failover server	Provides the following functions:

IQ Vision Ultimate Server/Service	Functions
	• Storage and retrieval of video and audio from MJPEG, MPEG4, MxPEG, and H264 devices • Standby for a single or a group of recording servers, when configured as a failover server • Edge Storage capability, which allows cameras to write to an Edge Storage device if the recording server is unreachable • Processing events, alerts, and actions
Management server	The Management Application is IQ Vision's user interface to the management server and provides the following functions: • Managing recording servers, users, and devices • System configuration wizards, automated device discovery, smart bulk configuration, event/alarm configuration, and management of user access privileges • Multi-stage storage schemes, which enable video migrations from primary storage (Live DB) to secondary storage (Archive DB) • Hosting and controlling access from IQ Vision Ultimate clients • Logging

The following figure shows a simple Godrej IQ Vision Ultimate architecture. You can scale the system by expanding the number of servers in each site, and you can combine many sites into a federated architecture.

Figure 1 Godrej IQ Vision Ultimate architecture



CHAPTER 3

Configured components

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

Dell EMC Surveillance Lab test environment

The Dell EMC Surveillance Lab is constantly being upgraded to the most recent software releases.

In order to test this solution, the Dell EMC Surveillance Lab was configured as follows:

For all the tests, the virtual CPU (vCPU), memory, and network were configured according to Godrej best practices. The VMware vSphere configuration was in accordance with the VMware Compatibility Guide (www.vmware.com/resources/compatibility/search.php). In addition, Dell EMC PowerPath™ is recommended for use with block storage (FC and iSCSI) implementations on VNX and VNXe arrays, while Microsoft MPIO is recommended for use with Unity arrays.

The Dell EMC Surveillance Lab's host hardware met and exceeded the minimum system requirements for an ESXi/ESX installation. The Godrej Recorder VM was running on an ESXi 6.5 host using Cisco UCS B230 Blade Servers with a 20-core ESXi host at 2.2 GHz and 128 GB memory.

Unity and VNX family array

With the Godrej IQ Vision solution, a Unity or VNX family array is used for the Live DB, Archive DB, and VMware Datastores.

Unity or VNX can be deployed with GigE or 10 GbE iSCSI NICs. Dell EMC PowerPath™ multipathing is recommended for block storage like VNX and VNXe. PowerPath multipathing automates data path management, failover and recovery, and optimized load balancing to ensure application availability and performance. Native operating system multiple path I/O (MPIO) is recommended for Unity arrays.

VNXe family array

With the Godrej IQ Vision solution, a VNXe family array is used for the Live DB. An iSCSI-connected VNXe array, implemented with storage pools, provides a cost-effective implementation while maintaining the expected performance. Many mid-sized deployments can use VNXe.

CHAPTER 4

Sizing the solution

This chapter provides information to enable you to quickly determine the correct storage array based on your customer's bandwidth requirements:

Sizing guidelines

For best performance and usability, IQ Vision and each storage tier must be correctly configured. This section describes the results of the solution testing as well as configuration settings we found important during our lab tests.

In the same way that the configuration and performance of one production implementation varies from another, lab tests also vary among production environments. Use the performance statistics and configuration information presented here as the base guideline.

For information about the test objectives and the test procedure, see Testing and validation overview.

Dell EMC Surveillance Lab testing shows that Storage Pools provide better performance and are easier to manage for the end customer. Therefore, validation tests are only conducted using Storage Pools. Although all the underlying Storage Pool's RAID Groups configurations perform equally with the surveillance workload, we recommend RAID 6 (6+2) for resilience.

Volume limits

Implementations greater than 8 TB are common when video is stored on high-end storage, such as VNX block storage.

Live DB sizing

The Live DB can reside on DAS or block (FC or iSCSI) storage.

For Live DB sizing we recommend the following:

- Set the Live DB retention period from 2 to 24 hours, depending on the implementation's requirements.
- To allow space for video file collection and periodic archiving from the Live DB to the Archive DB, size the available Live DB storage to be at least twice the duration that video is configured to reside on the Live DB. However, the size of the Live DB can be set to a greater value to meet the needs of a particular implementation. The additional space is to accommodate network maintenance, traffic congestion, and other conditions that may temporarily restrict the bandwidth in an IP network and take time to resolve. For a conservative implementation, you may want to include additional space to allow for break-fix conditions.

Note

The write block size is determined by how the LUN or disk was formatted. For more information, see the Hard disk formatting section in *Dell EMC Storage with Godrej IQ Vision: Configuration Guide*.

The following table shows details of Live DB performance on the Unity, VNX, VNXe, and VSS arrays during lab testing.

Table 1 Live DB performance with block storage

Array	Storage Pool				Maximum (RAW)
	Raid	Disks	iSCSI BW (MB/s)	FC BW (MB/s) **	
Unity300	5	80	226	249	2.34 PB
Unity400 *	5	120	345	380	3.9 PB
Unity500 *	5	120	397	436	7.8 PB
Unity600 *	5	120	456	502	9.7 PB
VNXe1600	6	72	350	385	400 TB
VNXe3200 *	6	72	372	409	500 TB
VNX-VSS100	5, 6	72	456	502	360 TB
VSS1600	6	72	350	385	500 TB
VNX5200	5, 6	90	543	597	500 TB
VNX5400 *	5, 6	120	543	597	1 PB
		250	543	597	
VNX5600	5, 6	120	678	746	2 PB
		240	1085	1194	
		500	1085	1194	
VNX5800 *	5, 6	120	814	895	3 PB
		240	1302	1433	
		360	1954	2149	
		750	1954	2149	
VNX7600 *	5, 6	120	977	1074	4 PB
		240	1563	1719	
		360	2344	2579	
		480	3126	3438	
		1000	3126	3438	
VNX8000 *	5, 6	120	1172	1289	6 PB
		240	1875	2063	
		360	2813	3094	
		480	3751	4126	
		600	3751	4126	
		1000	3751	4126	

* These values are extrapolated from Dell EMC Surveillance Lab test results.

** Bandwidth information for FC was extrapolated using the iSCSI bandwidth results.

The VNX family array architecture is optimized for storage pools. A storage pool is a construct that is built over one, or more commonly multiple, RAID groups. LUNs are built on top of the storage pool. The read/write activity is a random distribution across all disks defined to the storage pool. This distribution results in increased and balanced per disk utilization and improved performance when compared to traditional RAID implementations.

The RAID groups underlying storage pools can be either RAID 5 or RAID 6. The default and recommended RAID configuration for a VNXe or VSS1600 array using NL-SAS drives is RAID 6. Either RAID 5 or RAID 6 can be used with VNX arrays. RAID 5 is used for optimizing the array to achieve the maximum amount of storage and RAID 6 is used for enhancing data protection. Our tests using an isolated surveillance infrastructure did not reveal any notable performance variances when using RAID 5 as compared to RAID 6.

This guide provides details on the total load that was tested in the Dell EMC Surveillance Lab. However, the independent software vendor (ISV) should provide the actual server specification. The test results in this guide set a server bandwidth specification that is based on our lab environment, which can be used in the event the ISV does not provide these specifications.

Archive DB sizing

With IQ Vision Ultimate release 2016, you can use either file or block storage for the Archive DB.

When the Archive DB resides on EMC VNX family block storage, the LUN or disk being formatted determines the write block size. For more information, see the Hard disk formatting section in *Dell EMC Storage with Godrej IQ Vision: Configuration Guide*.

The following table provides information to help you understand the sizing components of SAN-based implementations.

Table 2 Archive DB performance with block storage

Array	Recorders	Array BW (MB/s)	BW per LUN (MB/s)	LUNs per pool	Disks per pool	Disk stats
Unity300	7	264.6	37.8	7	80	5503 GB
VNX-VSS100* iSCSI	1	94	94	1	88	4TB
	7	630	90	7	88	
VNXe1600 iSCSI	1	176	176	3	72	4 TB
	5	374	74.8	5	72	
VNX5200* iSCSI	7	630	94	7	88	4 TB
VNX5600* iSCSI	8	750	93.7	7	88	4 TB
VNX5800* FC and iSCSI	18	616	34.2	18	60	3 TB

* These values are extrapolated from Dell EMC Surveillance Lab test results.

Note

All disk drives are NL-SAS 7200 RPM unless otherwise noted.

VNX/VNXe with Live DB and Archive DB sizing

We tested with both Live DB and Archive DB writing to the same array for maximum bandwidth and performance on the single SP. Some recorders are implemented using FC storage and some using iSCSI storage for both the LiveDB and ArchiveDB.

The following table shows the LUNs per recording server and the bandwidth per LUN with the Live DB and the Archive DB using VNX iSCSI or FC.

Note

We captured the peak values of write bandwidth and read bandwidth on the single SP when the archive process is running. Maximum CPU utilization is captured when reviewing video at a rate of 20 percent of the current write rate and with a disk rebuild in progress. Bandwidth and CPU usage of the VNX vary with time, which is based on the archive process.

The following table shows details of Live DB and Archive DB performance.

Table 3 Table 1. Live DB and Archive DB performance

Storage platform	Total Recorders	Number of Cameras	Bandwidth (MB/s)				CPU on VNX SP (%)	
			Live DB Write	Archive DB Write	Total Write	Total Read	Max.	Average
Unity300	4	128	103.46	409.84	513.3	330.45	28.28	16.31
VNXe1600 iSCSI H264	1	32	32	123	155	30	43.9	19
VNX5800 FC and iSCSI H264	18	460	460	616	1076	684	90	72

Note

About nine recorders are implemented using FC SAN storage and remaining nine recorders using iSCSI SAN storage because of the server and network port limitations. The LiveDB was configured using Flash drives with a RAID1/0 Pool, while the ArchiveDB used NL-SAS drives with a RAID5 Pool.

This test uses the Axis Simulator with a camera resolution of H264, 1920x1080, and 30fps.

CHAPTER 5

Testing and validation

This chapter describes the testing used to validate this solution.

Test objectives

Many factors must be considered when designing your solution.

The Dell EMC Surveillance Lab tests focus on storage-related factors with the following objectives:

- Determine the bandwidth for various Dell EMC storage arrays using FC and iSCSI.
- Determine the best configuration parameters for VNX storage options.
- Determine best video storage performance requirements for use with VNX storage arrays.
- Determine the maximum bandwidth with multiple Recorders.
- Determine all factors with a lab-controlled failure, such as disabling a storage processor, rebuilding disks, or network path failures.

Test parameters

All test parameters and scenarios reflect standard production behavior for Godrej IQ Vision Ultimate under storage intensive conditions, including typical storage functions and failures. We followed best practices for recovery and break-fix issues for normal situations that might arise in a standard production environment.

We used the following parameters to perform the tests:

- The IP network (Layer 2) is a flat, high-availability network with plenty of capacity, which enabled us to focus on the products we were testing.
- All tests assumed uniform distribution of bandwidth from the Godrej Recorder.
- All tests were performed with a per-camera bandwidth of 8 Mb/s, so a single Recorder that handles 40 MB/s can support 40 such cameras.

Storage bandwidth and configuration test

The storage bandwidth test evaluated video storage and applications with a number of different Dell EMC storage systems. Additional tests evaluated ESXi host hardware in relationship to vCPU settings and the resulting bandwidths.

These tests assumed that Godrej IQ Vision Ultimate was configured as described by Godrej's best practices and operated within the recommended bandwidth, camera count, and other Godrej maximum requirements.

Procedure

1. Configured video storage for a Dell EMC storage system.
2. Set up camera simulators (traffic generators) to produce a traffic load to each Godrej Recorder at the recommended bandwidth.
3. Verified that motion detection was in the **On** state for all cameras.
4. Evaluated the network and video storage to ensure an error-free environment at the induced bandwidth.
5. Introduced storage device errors including:
    - Disk failures and rebuilds on VNX and VNXe arrays
    - Use of only one VNX or VNXe storage processor

- NIC failures with active/active and active/passive configurations

6. Captured the storage system and host statistics.
7. Based on the test results:
   - If no issues were detected, incremented the bandwidth.
   - If issues were detected, decreased the bandwidth.

   This procedure was repeated until the maximum error-free bandwidth was determined.

CHAPTER 6

Conclusion

This chapter summarizes the testing for this solution:

Summary

Dell EMC performed comprehensive testing with Godrej IQ Vision Ultimate 2016 to benchmark application performance in a Godrej tiered storage environment.

We tested an FC- and iSCSI-attached VNX for the both Live DB and Archive DB. The results for this configuration represent the maximum tested, not the array maximum.

For both FC- and iSCSI-attached storage, formatting with 8192 B blocks for Live DB and 64 KB blocks for Archive DB is required.

Testing and validation of this solution produced these key findings:

- FC- or iSCSI-attached VNX can be used in place of internal server storage for both Live DB and Archive DB video storage.
- Bandwidth to the VNX arrays for the Archive DB was not affected during numerous forced failures on the array.

EMC Unity and EMC VNX arrays

The use of storage pools to create LUNs within the EMC Unity and EMC VNX arrays greatly simplifies the configuration and increases the performance when compared to traditional block-level storage. Either iSCSI or FC can be implemented. FC performs better than iSCSI.

EMC VNX-VSS arrays

The VNX Video Surveillance Storage (VSS) is a storage solution that is purpose built to meet the unique demands of the video surveillance environment.

We found that this high availability, low-cost array performs comparably to other arrays in the VNX family.

EMC VNXe arrays

An iSCSI-connected VNXe array, implemented with storage pools, provides a cost-effective implementation while maintaining the expected performance. Many mid-sized deployments can use VNXe.