Running Milestone XProtect with the Dell FS8600 Scale-out File System

Dell Storage Engineering
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A Dell Reference Architecture

Revisions

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1 Introduction

This document describes the reference architecture of infrastructure solutions that include Dell FS8600 and Milestone XProtect Corporate. The topics included in this document provide the fundamental knowledge and tools needed to make vital decisions to optimize the solution with regards to its flexibility, scalability, performance, security and data protection.

The conceptual set up and tuning recommendations in this paper do not include step-by-step procedures. When necessary, references to these instructions are provided. In general, the reader is encouraged to use this document in conjunction with the FluidFS Admin Guide, which includes detailed descriptions of the Fluid File System (FluidFS) features and configuration procedures.

1.1 Audience

This document is intended for system, network and/or storage administrators and integrators who plan to deploy FluidFS as a storage solution for Milestone XProtect Corporate software. It is assumed throughout the document that the reader is familiar with the following topics:

- The Dell FluidFS network attached storage platform functionality, features, installation, user interface and operation
- SMB protocol implementation and terminology
- Milestone XProtect Corporate software components (Management server, record server and client viewer)

1.2 The Dell FS8600 overview

FluidFS is an enterprise-class, fully distributed file system that provides customers with the tools necessary to manage file data in an efficient and simple manner. The underlying software architecture leverages a symmetric clustering model with distributed metadata, native load balancing, advanced caching capabilities and a rich set of enterprise-class features. FluidFS removes the scalability limitations such as the limited volume size associated with traditional file systems, and supports high capacity, performance-intensive workloads by scaling up (adding capacity to the system) and scaling out (adding nodes, or performance, to the system).

FS8600 scale-out NAS consists of one to four FS8600 appliances configured as a FluidFS cluster. Each NAS appliance is a rack-mounted 2U chassis that contains two hot-swappable NAS controllers in an active-active configuration. In a NAS appliance, the second NAS controller that has one paired NAS controller is called the peer controller. FS8600 scale-out NAS supports expansion; NAS appliances can be added to the FluidFS cluster as needed to increase performance.

The FS8600 shares a back-end infrastructure with the Storage Center. The SAN network connects the FS8600 to the Storage Center and carries the block level traffic. The FS8600 communicates with the Storage Center using either iSCSI or Fibre Channel protocol, depending on the NAS appliance configuration purchased.

1.3 Milestone XProtect Corporate overview

Milestone XProtect Corporate is a surveillance video management software designed for large-scale deployments with extensive integration of a large selection of cameras and specialized analytic processing modules.

Milestone XProtect storage architecture consists of a proprietary Milestone surveillance database specifically designed and optimized for video surveillance usage with efficient storage of multiple real-time video streams that have optional archive functions to seamlessly move the live surveillance databases to online archive drives.

Milestone XProtect includes the following components:

XProtect Management server: The management server stores the surveillance system configuration in a relational database, either on the management server computer itself or on a separate SQL Server on the network. It also handles user authentication, user rights, and more.

XProtect Recording server: Used for recording video and for communicating with cameras and other devices. In large installations, more than one recording server is often used on the surveillance system. Failover recording servers can be set up to take over if a recording server becomes temporarily unavailable.

XProtect Smart Client: XProtect Smart Client is the main client application that provides intuitive control over your system setup. It gives access to live and recorded video, instant control of cameras and connected security devices, and a comprehensive overview of recordings. It has an adaptable user interface that can be optimized for individual operators' tasks and adjusted according to specific skills and authority levels.

2 Dell FS8600 and Milestone solution

In the tests run to support this paper, the optimal configuration was discovered and is documented below.

2.1 Video surveillance

The storage requirements for video surveillance can vary. Dell FS8600 NAS storage can fit into all environments including small business and enterprises.

Dell FS8600 NAS storage provides the following key features:

- Centralized storage management for both NAS and SAN
- Capacity optimization features including deduplication, compression and thin provisioning
- Highly scalable for performance and capacity
- Highly available, providing the five nines of availability
- Dell FluidFS support multi-petabyte NAS Pool
- Automatic storage tiering and data placement
- Enterprise grade centralized storage for video archive

  By using Centralized storage for archive DB you gain maximum space utilization efficiency and reduce management overhead by having a single point of management for the storage

2.2 Solution architecture

The following solution will demonstrate the use of Dell FS8600 NAS storage with Milestone XProtect Corporate software.

Table 1 Reference architecture hardware components and configuration

Hardware	Quantity	Configuration	Purpose
Stable FPS Cameras	1500	H.264 1080x720 30fps	Simulated cameras
Force 10 S4810	2	Standard configuration	Network connectivity
Brocade 6505	2	Standard configuration + zones for fabric	FC connectivity
Dell PowerEdge R620	13	2 CPU 16G RAM Internal Raid 5 HDD	Recording/Client View and MGMT servers
FS8600	1	Single Appliance	NAS
Dell SC8000	2	Dual controller , FC connectivity	Block storage
Dell SC280	2	168 4TB 7.2K Drives	Disks for block storage

Table 2 Reference architecture software

Software	Version	Purpose
XProtect Corporate	4	Recoding servers software
XProtect Smart Client	0.7.A	Smart Client Software
XProtect Management	0.9.A	Management server software
FluidFS	V3	FS8600 Scale out Filesystem
Windows 2012	R2	OS for Recording /Client view and MGMT servers

2.3 Architecture diagram

The following Diagram shows the Milestone XProtect Corporate video surveillance infrastructure integration with the Dell FS8600. This solution uses the Dell FluidFS and SMB2.1 protocol for Microsoft Windows environment.

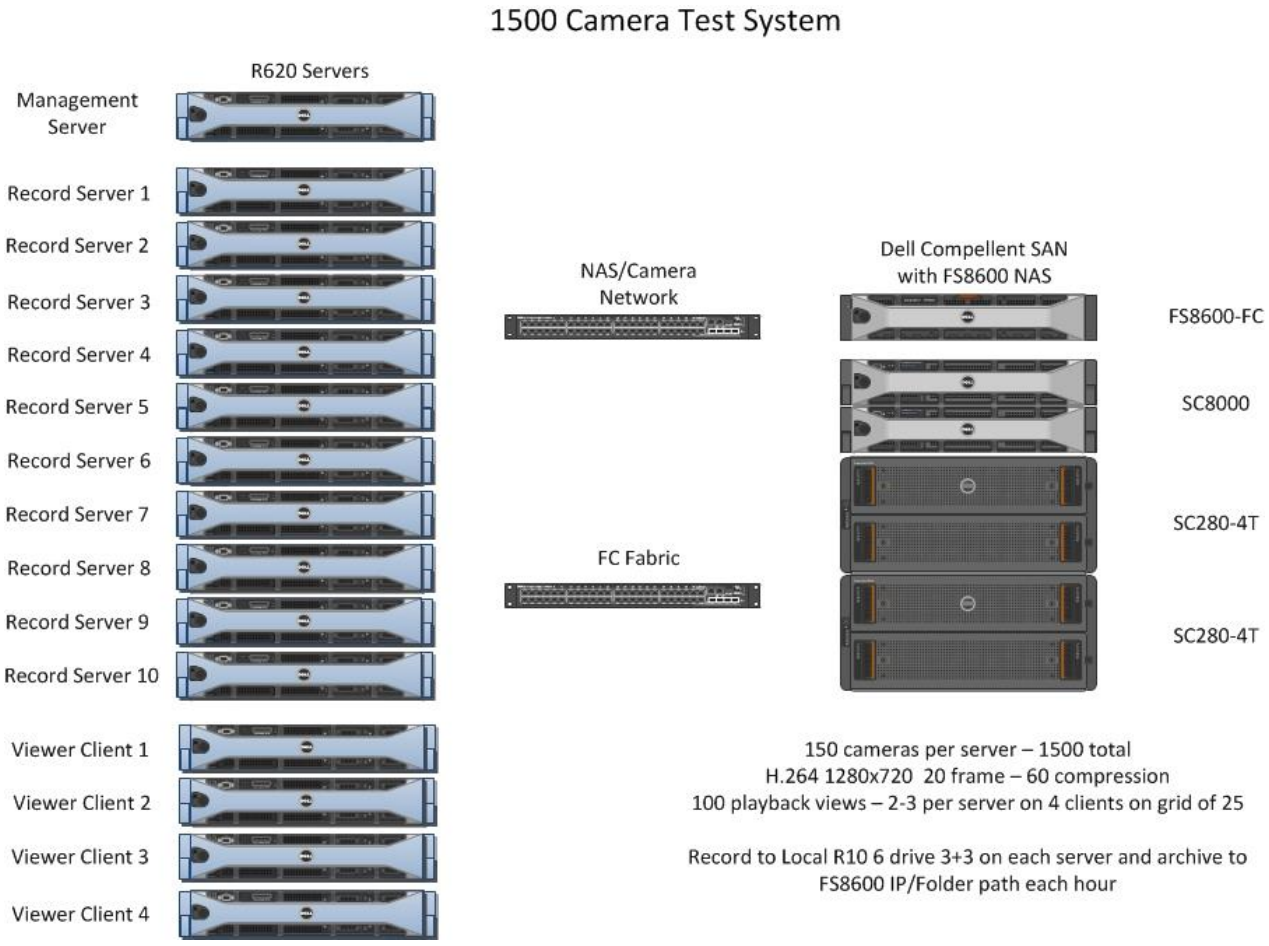

Figure 1 Milestone XProtect reference architecture

2.4 Topology

The system topology included 15 servers running a Microsoft Windows x64 based Server 2012 operating system hosting the Milestone XProtect Corporate Management Server, Management Client and Smart Clients. Servers were allocated as:

- 1 Management Server –1500 camera configuration
- 10 Record Servers – up to 150 cameras per server
- 4 View Clients – grid of 25 playback per server – 100 view streams

The FS8600 utilizes 10 Gigabit Ethernet interfaces to serve record servers SMB connections. The Dell FS8600 is configured as a dual controller NAS appliance connected to the dual controller active-active SC8000 storage controller to achieve high availably functionality.

One instance of the video feed simulator and video content files were placed on each Record Server. In this configuration, video streams are sent across the IP network to be recorded first locally on each Record Server and then archived to FS8600 for long-term storage. Placing the video stream sources within each recording server removes any potential network bottlenecks between cameras, encoders, or other video sources and the recording servers themselves. The specific configurations detailed above were chosen in order to conform to the recommended Milestone storage configuration, providing a live database and an archive database for each recording server.

2.5 Storage System Configuration

Using the built in storage configuration tools available through the Dell FS8600 Enterprise Manager graphical user interface (GUI), a NAS pool was created from 168 4TB 7200 RPM NLSAS drives. This NAS pool had individual folders for each recording server archive database that held logical partitioning of video data. Data was moved from local drives inside each record server to the Dell FS8600 by SMB connection on an interleaved archive schedule every hour.

Fluid FS supports automatic load balancing of traffic to the NAS controllers. The load balancing mechanism is designed to support a large quantity of clients. In a common implementation, clients use the Virtual IP (VIP) address of a system to access it. Client network connection to a VIP is directed by the load balancing mechanism to one of the available controllers. FluidFS can support multiple VIPs per subnet served, this reference architecture is configured with 10 VIPs one per recording server.

A NAS Volume is a subset of FluidFS, with specific policies controlling its space allocation, data protection and security style. Each NAS Volume has a file system that holds user data. In order to make a NAS Volume available to users, each volume must be shared or exported separately. Milestone recommends always configuring both a live and an archive database. For this test, each XProtect Recording Server was configured to use two Terabytes of internal local storage as a live volume database, and six Terabytes by SMB share as the archive database. These sizes were used to support an efficient testing process. Increasing these sizes in operational video surveillance deployments will not negatively affect performance results. Video was initially written to the live database, and later moved to the archive database. Retention times for each tier were set at 2 and 20 hours respectively. Once the archive was full, the oldest data was

deleted and incoming data stored. This process caused overhead, and simulated a system in long-term operations.

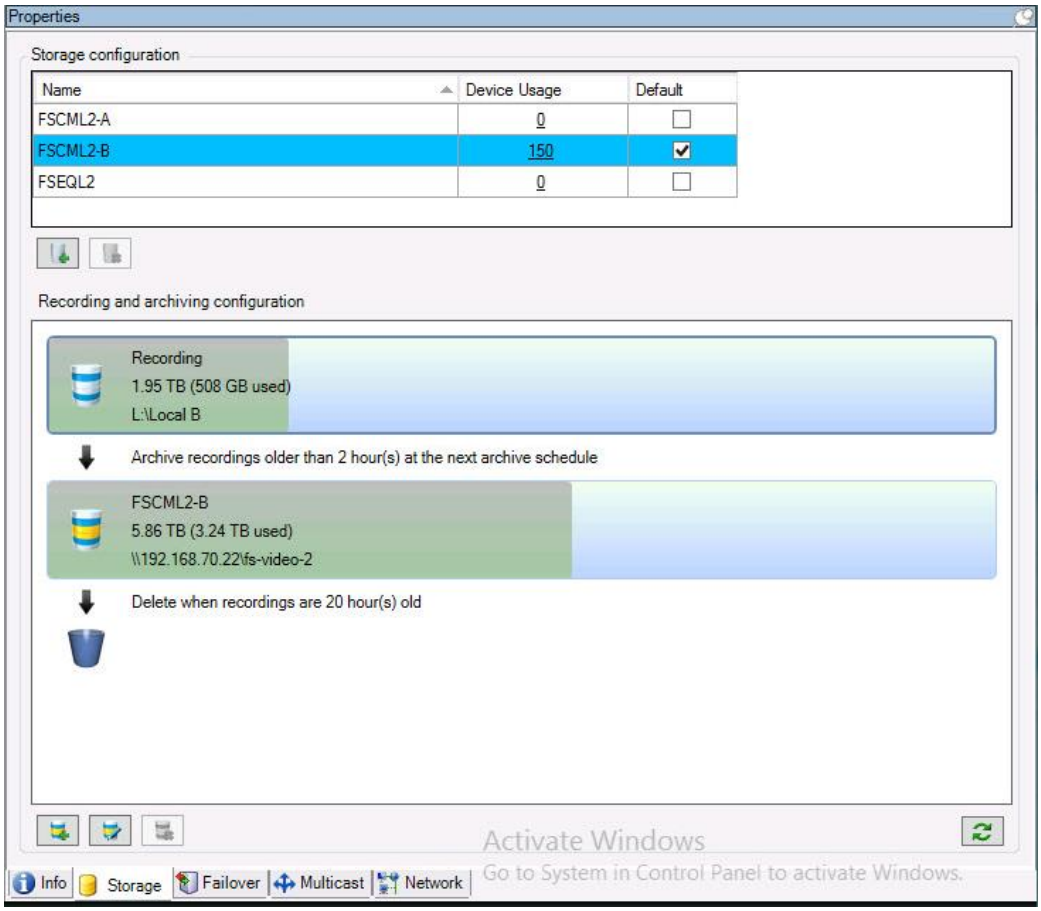

Figure 2 Live and archive video database sizes of 2 and 6 terabytes respectively

To achieve optimal performance, the Dell FS8600 solution was configured to have a live database on each record server and the archive database on the CIFS share. In order to simulate a real-life scenario, four view clients played back 25 streams each; a total of 100 streams were played back from the FS8600 while writing streams to it.

This configuration used direct write to RAID 6 which provided the highest capacity and read/write performance with no additional data migration overhead.

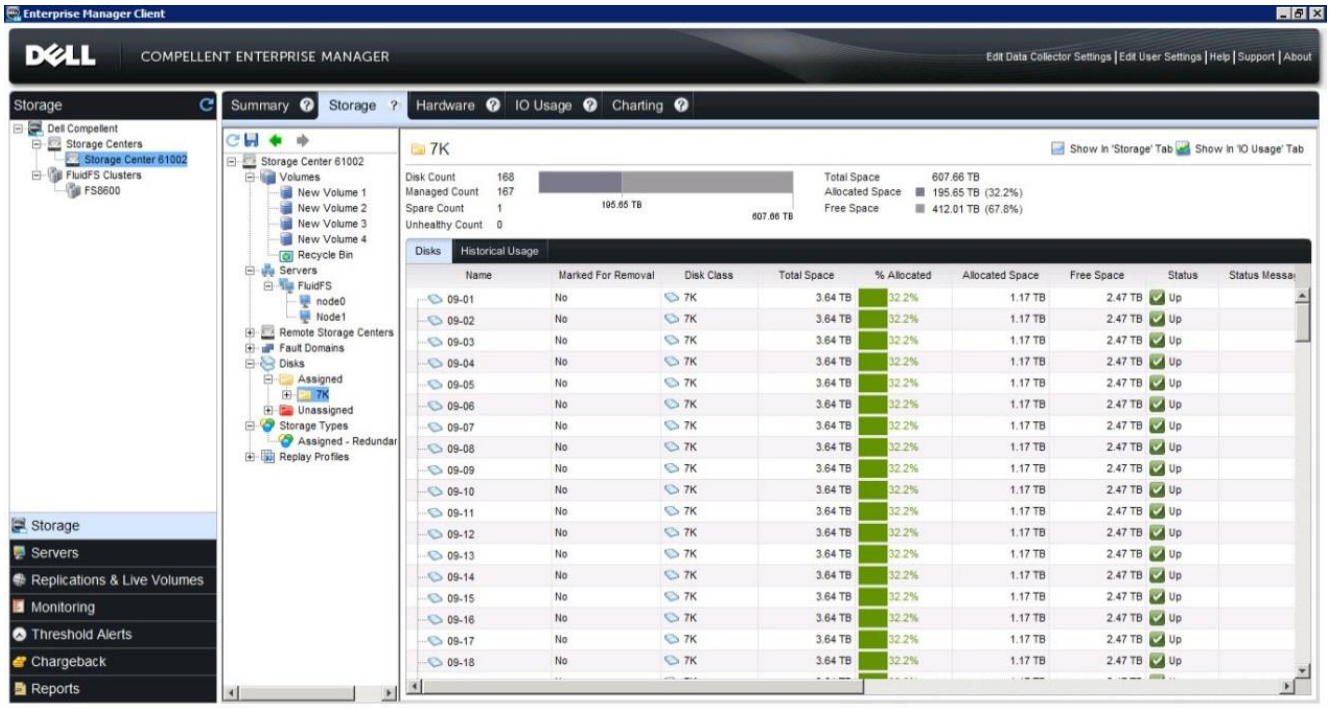

Figure 3 Enterprise Manager display indicating all active physical disks in the RAID 6 logical disk array

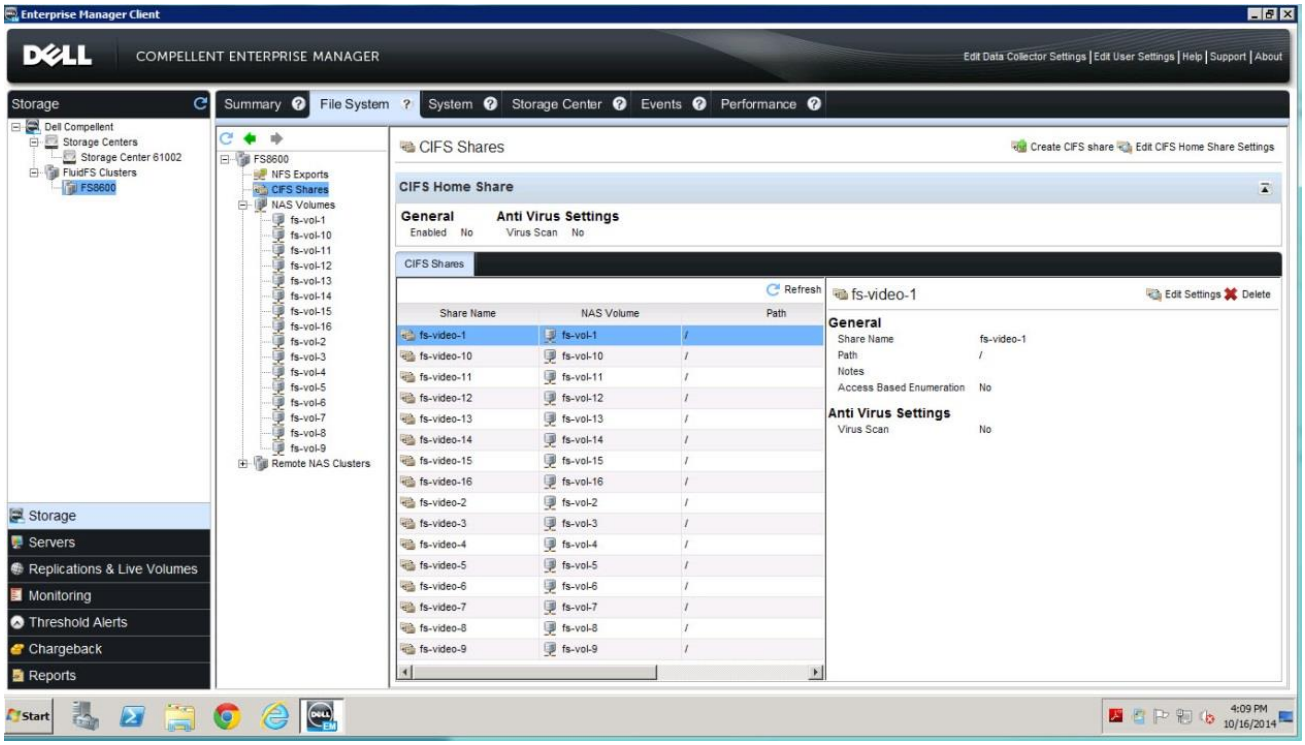

Figure 4 FS8600 NAS volumes and SMB shares

2.6 Milestone XProtect configuration

The video management software used in testing was set up to provide a real-world configuration and the most efficient solution.

2.6.1 Cameras settings

H.264 is fast becoming the standard for HD resolution video streaming. The 1280x720P format is a base HD level pixel map that can be achieved by most modern cameras and easily comparable to estimate higher bit rates.

30 FPS (Frames per second) is the standard full motion frame rate, with a range of 10-20 FPS being used in most Surveillance deployments as a tradeoff for storage space and motion continuity.

For this reference architecture, a frame rate of 20 FPS was chosen as a common resolution. Up to 1500 cameras were spread over 10 record servers for testing.

2.6.2 Recoding server local disks configuration

The local record server needs high performance storage to keep up with continuous high bandwidth write traffic created by the many camera feeds received by each record server. Typically, RAID 10 is used with 10K or 15K SAS drives to optimize the workload performance which includes video and metadata about the recordings.

2.6.3 Recoding server Optimization

To take advantage of the FS8600 and optimize archive traffic Bandwidth from each Milestone Xprotect Corporate record server, some parameter adjustments to I/O size and thread count are advised.

After consulting with Milestone, the following settings in the Recorderconfig.XML file were changed in the testing environment.

- MaxFramesinqueue = 200
- Delete_thread_pool_size = 2
- Low_priority_archive_thread_pool_size=4
- Write_buffer_size=65536

Note: The Recorderconfig.XML file located in the .../ProgramData/Milestone/XProtect Recording Server directory.

3 Storage scaling conclusion

The FS86000 offers exceptional scale up and out capabilities. Scaling out the system described in this reference architecture by adding an additional FS8600 appliance and additional SC8000 controllers (along with disk drives) will provide almost linear performance increase, system wide. This solution would provide space to archive about 3000 video cameras. Consult a Dell representative for sizing details.

The FS8600 storage solution for Milestone video surveillance software in this reference architecture demonstrated the simplicity of integration. This solution is scalable by aggregating an additional storage subsystem into additional FS8600 nodes.

A Additional resources

Support.dell.com is focused on meeting customer needs with proven services and support.

DellTechCenter.com is an IT community that facilitates communication between Dell customers and Dell employees for the purpose of sharing knowledge, best practices and information about Dell products and installations.

Referenced or recommended Dell Compellent publications on Dell TechCenter

- *Dell Compellent FS8600*
  http://en.community.dell.com/techcenter/storage/w/wiki/4135.dell-compellent-fs8600.aspx
- *Dell Compellent FluidFS v3 (FS8600) Networking Best Practices*
  http://en.community.dell.com/techcenter/extras/m/white_papers/20437940.aspx