




# Vess A2000 Series NVR Storage Appliance *Milestone Surveillance Solution*





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## Introduction

### Overview

This document provides an overview of the Promise Vess A2000 Series NVR Storage Appliance. It includes a test case that simulate a large scale network based surveillance solution. The test case utilizes Milestone Xprotect® VMS to determine performance results.

This document also includes key performance indicators and test results for reference and comparison.





## Purpose

Purpose of this document is to demonstrate the capabilities of Vess A2000 Series platform, in optimally utilizing the resources for NVR usage.

This note gives the detailed understanding of overall Vess A2000 Series platform and Milestone VMS based surveillance solution.

The monitor data indicates the improved performance results using same/similar hardware components.

## Scope

Scope of this document is to create and test an IP camera based surveillance solution using the Promise Vess A2000 Series NVR Storage Appliance with the Promise RAID platform running a Milestone VMS software solution.


This note limits itself within the resource intense test configurations intended to simulate a real use large scale surveillance application environment. It does not test and verify every given matrix of video and hardware variables.

## Audience

Audience of this document includes design and deployment Engineers, as well as persons involved in sale and marketing of Vess A2000 Series based Milestone solutions.

## Components

Key components involved in technical note are:

- Promise Vess A2200 NVR Storage Appliance and Vess A2600 NVR Storage Appliance, hardware and Promise RAID platform
  - Milestone XProtect Corporate video surveillance software
- 



## Promise Vess A2000 Series System

The Vess A2000 NVR storage appliance is specially engineered for medium to large scale IP video surveillance deployment. The subsystems provide continuous recording and playback operation for networked installations of 32 to 100 High-Definition IP cameras.

The Vess A2000 Series includes the robust and market tested Promise RAID engine, Intel based server platform, industrial grade housing, smart sensors thermal and electrical enclosure protection, N+1 power redundancy, a choice of Linux or Windows operating systems, and intuitive web-based graphical user interface and command line utility for simplified system administration.

Promise Technology Inc is a longtime market leader of RAID based storage solution.

## Hardware Components

This document presents two systems for testing:

- Vess A2600 NVR Storage Appliance 3U 16-Bay system that includes:
- Intel Xeon E3-1245V2 (CPU Benchmark: 8942)
- 8GB DDR3 RAM.
- Four gigabit network ports.

Vess A2200 NVR Storage Appliance 2U 6-Bay system that includes:

- Intel i3-3225 (CPU benchmark: 4360)
- 4GB DDR3 RAM.
- Four gigabit network ports.

## Operating System

- 64bit Windows Embedded Standard 7 + Service Pack 1

## RAID Engine

This test utilizes all drives in single Logical Drive in a RAID 5 arrangement.





## Milestone XProtect Corporate VMS

Milestone is a market leader in IP-based video surveillance applications. XProtect® Corporate is designed for large scale installation using distributed system architecture.

The setup architecture can include multiple recording, management and log servers spread across multiple locations. Smart and Remote clients are applications used to view and analyze video data as live stream or play-back.

### Recording Server

The recording server is the hub of all XProtect® activities. A recording server is connected to all cameras of the setup. This server stores the video streams and provides video data to client applications.

The Vess A2000 Series NVR Storage Appliance functions as the host to this recording service and provides the RAID based logical drive for data storage.

### Management Server

The XProtect management server is the main component of the software package, used to configure, store and assign different features and settings of the application.

The management server is independent of the recording server. It can be installed at any remote location within the domain.

### Management Client

The management client is the user interface of the management server. The GUI is designed to manage system configuration as well as daily activities.

### Smart and Remote Client

Smart and Remote Clients are the video viewer applications. These applications are not used in this test case.

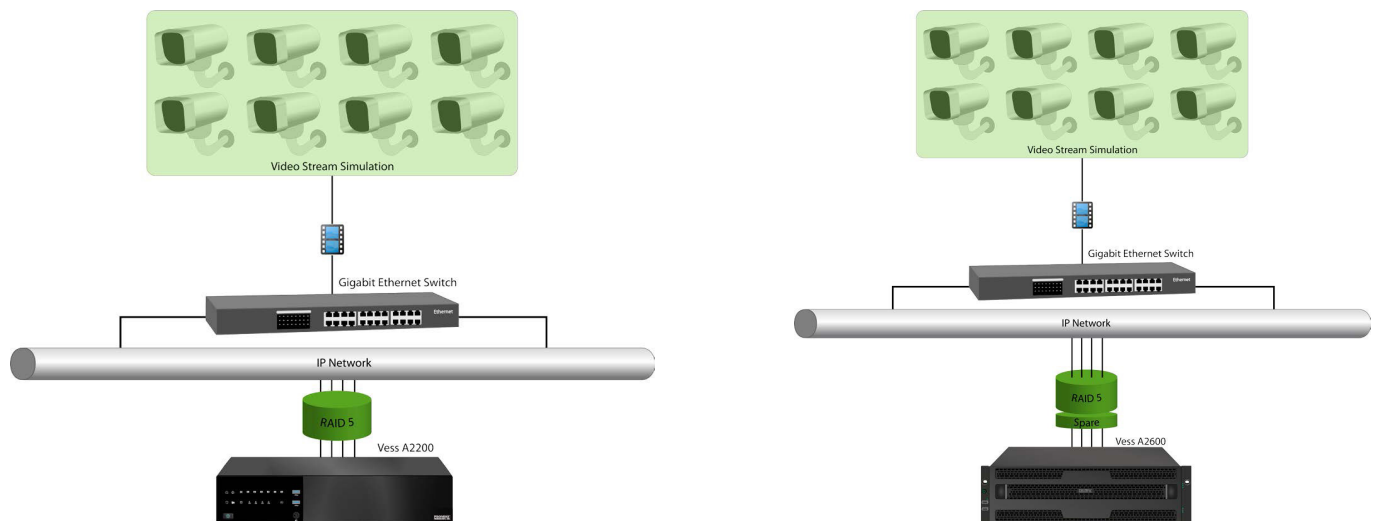
## Test Environment

### Machine Under Test (MUT) System configuration

	Vess A2600	Vess A2200
<b>VMS</b>	XProtect Corporate 5.0c	XProtect Corporate 5.0c
<b>OS</b>	Windows Embedded Standard 7 SP1 64bit	Windows Embedded Standard 7 SP1 64bit
<b>CPU</b>	Xeon E3-1245V2 CPU Benchmark: 8942	i3-3225 CPU benchmark: 4360
<b>RAM</b>	8GB DDR3	GB DDR3
<b>HDD</b>	16SATA HDD	6SATA HDD
<b>RAID CFG</b>	R5 + Spare	R5
<b>Install PKG</b>	1.00.0000.53	1.00.0000.53
<b>DOM</b>	32GB	32GB

## Topology

Test Topology Includes the VessA2000 and a Virtual Video Stream feed server. All Milestone software components are installed on the Vess A2000, including, the recording server, management server and management client.





## Test Matrix and Criteria

To evaluate different aspects of the solution, the test is divided into multiple parts:

VA System	Test Purpose	Video Stream Variables
VA2600	Platform Performance Test	Codec: H.264; Res: 1280 x 720; FPS: 30; Bitrate: 4Mbps.
VA2200	Platform Performance Test	Codec: H.264; Res: 1280 x 720; FPS: 30; Bitrate: 4Mbps.
VA2600	Throughput Test	Codec: MJPEG; Res: 1920x1440; FPS: 30; Max Bandwidth: 4Mbps.
VA2200	Throughput Test	Codec: MJPEG; Res: 1920x1440; FPS: 30; Max Bandwidth: 4Mbps.

The focus of the platform stress test is to test the system using real world user settings.

The throughput test demonstrates the capability of the Vess A2000 system in handling large volume data streams.

Conditions to obtain the results includes:

- CPU utilization must remain below 95%.
- The difference between “bytes per second” at Milestone Database Write and Windows Physical Disk Write must not exceed 2%.

## Vess A2000 Platform Performance

## Vess A2600 Platform Performance

### Overview

This test simulates real world user settings. It is intended to check the stability and performance of the Vess A2600 system.

Video stream configurations used in this test are:

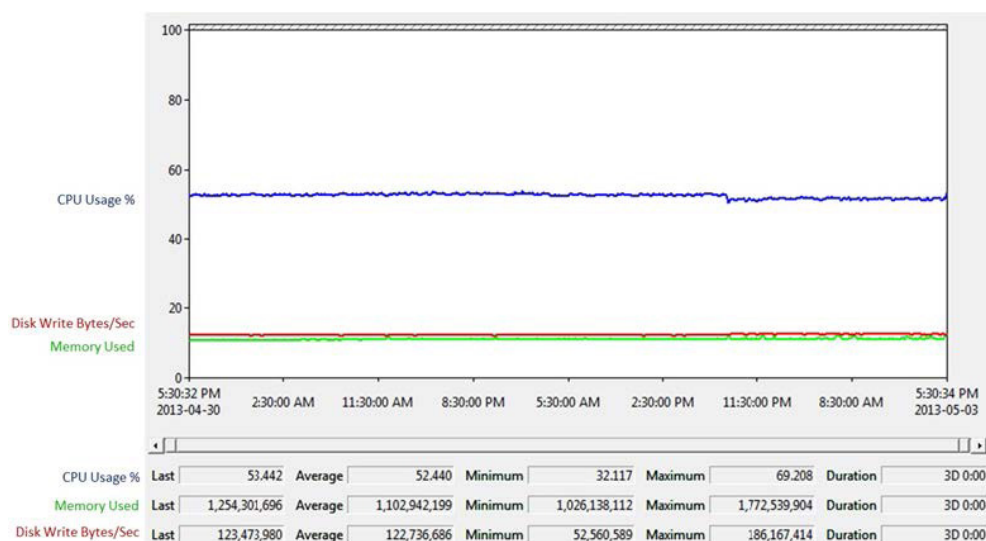
- Codec: H.264
- Res: 1280 x 720
- FPS: 30
- Compression ratio: Q30

### Observation and Highlights

Test result establishes that Vess A2600 system is able to maintain the average throughput of about 149 MB/s, while processing 130 cameras at HD resolution.

CPU usage stays below 60%, and no major fluctuation is observed. Relatively low CPU utilization leaves enough room to run other user applications.

There is no fluctuation in memory usage of Milestone Software



## Vess A2200 Platform Performance

### Overview

This test simulates real world user settings. It is intended to check the stability and performance of the Vess A2200 system.

Video stream configurations used in this test are:

- Codec: H.264
- Res: 1280 x 720
- FPS: 30
- Compression ratio: Q30

### Observation and Highlights

Test result establishes that Vess A2200 system is able to maintain the average throughput of about 74 MB/s, while processing 65cameras at HD resolution.

CPU usage stays below 60%, and no major fluctuation is observed. Relatively low CPU utilization leaves enough room to run other user applications.

Note that the fluctuation in observed CPU usage and throughput is due to increased Split IO caused by the VMS application



## Vess A2600 Throughput Performance Test

### Overview

This test is conducted to determine the maximum achievable throughput.

Video stream configurations used in this test are:

- Codec: MJPEG
- Res: 1920x1440
- FPS: 30
- Compression ratio: Q30

### Observation and Highlights

Test result shows that Vess A2600 system maintains average throughput of about 228 MB/s.

Average CPU usage is observed around 81%, It is to be noted that Promise RAID engine utilize only single thread. Rests of the CPU threads are available for VMS or user software.

There is no fluctuation in memory usage of Milestone Software.



## Vess A2200 Throughput Performance Test

### Overview

This test is conducted to determine the maximum achievable throughput.

Video stream configurations used in this test are:

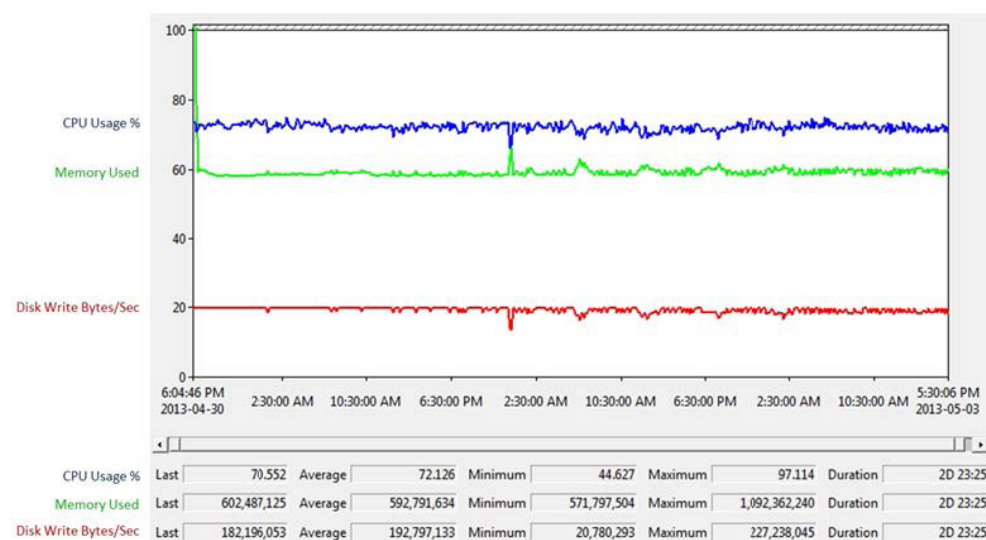
- Codec: MJPEG
- Res: 1920x1440
- FPS: 30
- Compression ratio: Q30

### Observation and Highlights

Test result shows that Vess A2200 system maintains average throughput of about 180 MB/s.

Average CPU usage is observed below 80%, It is to be noted that Promise RAID engine utilize only single thread. Rests of the CPU threads are available for VMS or user software.

There is no fluctuation in memory usage of Milestone Software.



## Recording during Rebuilding

### Overview

This test provides an overview of system performance under different RAID configurations.

Video stream configurations used in this test are:

- Codec: H.264
- Res: 1280 x 720
- FPS: 30
- Compression ratio: Q30

### Observation and Highlights

- It is observed that both Vess A2600 and Vess A2200 ran stable throughput the test
- There is virtually no impact of rebuilding processed on recording stream.

	Recording and Rebuilding		Recording Only	
	Cameras	Throughput	Cameras	Throughput
Vess A2600	130	151 MB/s	125	135 MB/s
Vess A2200	65	74 MB/s	65	74 MB/s

## Simultaneous Recording and Live View

### Overview

Live view is the major part of video surveillance systems. In live view mode, the Recording server platform not only records the incoming surveillance camera feed, but dispatches the live stream to viewer client application within the network.

This test is performed to evaluate the ability of the Vess A2000 Series NVR Storage Appliance system, in handling simultaneous Incoming and Outgoing data streams.

Keeping with the common practice, the number of live view output is restricted to 16 channels.

- Codec: H.264
- Res: 1280 x 720
- FPS: 30
- Compression ratio: Q30

### Observation and Highlights

- It is observed that both Vess A2600 and Vess A2200 ran stable throughput the test
- It is observed that on Vess A2600 there is virtually no impact of 16 channel Live View on recording stream.

	Recording and 16 Channel Live view		Recording Only	
	Cameras	Throughput	Cameras	Throughput
Vess A2600	95	110 MB/s	125	135 MB/s
Vess A2200	60	60 MB/s	65	74 MB/s

## Simultaneous Recording and Play Back

### Overview

Playing Back of the pre-recorded video is a necessary requirement of surveillance and security setup. Unlike the Live View, Play Back is more taxing on storage algorithm.

A playback video footage can be located at any random place, far away from the recording location, within the disk array. A robust RAID algorithm should be able to handle the random access of read (playback) and write (recording) gracefully.

Minimal impact on performance is expected.

To keep with common practice, the number of play back output is restricted to 16 channels in Vess A2600 and 8 channels in Vess A2200.

Video stream configurations used in this test are:

- Codec: H.264
- Res: 1280 x 720
- FPS: 30
- Compression ratio: Q30

### Observation and Highlights

- It is observed that both Vess A2600 and Vess A2200 ran stable throughput the test
- No impact of 16 channels Play Back is observed on Vess A2600.

	Recording and 16 Channel Play Back		Recording Only	
	Cameras	Throughput	Cameras	Throughput
Vess A2600	125	134 MB/s	125	135 MB/s
Vess A2200	65	75 MB/s	65	74 MB/s



## Expansion and Archiving

### Overview

Expansion and archiving is one of the most important aspects of video surveillance setup. In most of the countries, it is legally binding on the user to keep the recorded footage for certain period of time. Promise Technology provides a series of RAID subsystems to archive the cold data. This test usage Promise RAID subsystem Vess R2600fiS, to evaluate the archiving feature.

Video stream configurations used in this test are:

- Codec: H.264
- Res: 1280 x 720
- FPS: 30
- Compression ratio: Q30

### Topology

Test Topology Includes the Vess A2000 and a Virtual Video Stream feed server. All Milestone software components are installed on the Vess A2000, including, the recording server, management server and management client. One Vess A2000 Ethernet port is directly connected to Vess R2000 Archive Expansion unit.



### Observation and Highlights

Archiving is more complex and put more pressure on storage. Reading (archiving) and writing (recording) simultaneously is a random access format. An idea storage system should be able to handle the random access read/write gracefully.

It is observed that there is minimum drop in collective throughput (read and write) while archiving the data.

Video stream configurations used in this test are:

- Codec: H.264
- Res: 1280 x 720
- FPS: 30
- Compression ratio: Q30

### Observation and Highlights

- It is observed that both Vess A2600 and Vess A2200 ran stable throughput the test.
- No impact of 16 channels Play Back is observed on Vess A2600.

	Recording and Archiving			Recording Only	
	Cameras	Read Throughput	Write Throughput	Cameras	Write Throughput
<b>A2600</b>	135	60 MB/s	60 MB/s	125	135 MB/s
<b>A2200</b>	80	37 MB/s	37 MB/s	65	74 MB/s

## Competitor Data Comparison

This table compares Vess A2600 and Vess A2200 with few competitors.

Video stream configurations used in this test are:

- Codec: H.264
- Res: 1280 x 720
- FPS: 30
- Compression ratio: Q30

## System Configuration

	Vess A2600	Vess A2200	H Company	S Company
<b>CPU</b>	Intel Xeon E3-1245 V2 @ 3.40GHz	Intel Core i3-3225 @ 3.30GHz	Intel Xeon E5-1620 @ 3.60GHz	Intel Core i3-3220 @ 3.30GHz
<b>Pass Mark CPU Mark</b>	8942	4363	9171	4233
<b>Chipset</b>	Intel C206	Intel C206	Intel C602	Intel C216
<b>Memory</b>	8GB	4GB	8GB	8GB
<b>RAID Controller of Testing</b>	Promise RAID	Promise RAID	LSI 9260-8i SAS 6Gb/s ROC RAID Card	Intel SATA RAID Controller (SWROMB)

Competitor Test Comparison Table: Feature Test

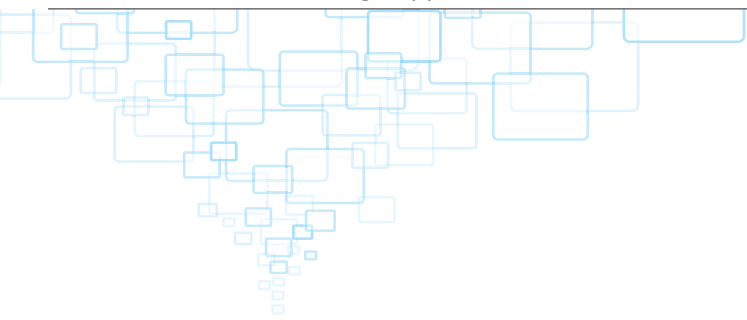
		Recording Only	Recording while RAID is Critical	Recording during RAID is Rebuilding	Recording and 16 Cnl Live View	Recording and 16 Cnl Play Back
Vess A2600	No of Camera	130	130	130	125	125
	Bandwidth (MB/s)	149.47	149.82	151.46	146.44	134.24
H Company	No of Camera	95	95	95	95	95
	Bandwidth (MB/s)	110.97	110.81	110.92	109.59	110.13
Vess A2200	No of Camera	65	65	65	60	65
	Bandwidth (MB/s)	74.06	74.43	73.85	69.18	75.31
S Company	No of Camera	55	5	5	60	50
	Bandwidth (MB/s)	63.99	2.75	2.81	70.51	58.35

**Competitor Test Comparison Table: Archiving**

For all archiving tests, Recording Frame Rate of 10 fps is used:

- Codec: H.264
- Res: 1280 x 720
- FPS: 10
- Compression ratio: Q30

	Recording and Archiving		
	No of Cameras	Throughput Write	Throughput Read
<b>Vess A2600</b>	135	60 MB/s	60 MB/s
<b>H Company</b>	105	48 MB/s	37 MB/s
<b>Vess A2200</b>	80	37 MB/s	37 MB/s
<b>S Company</b>	45	23 MB/s	20 MB/s



## Conclusion and Observation

Major requirement of Surveillance Recording Servers are:

**Stability:** Stability of Surveillance Recording Server is very important for critical safety and security related applications. A Surveillance Recording Server System should maintain stable operation for long periods of time.

**RAID Storage Throughput:** Storage data throughput is typically the first performance bottleneck encountered in Surveillance Servers. A surveillance setup generates a complex data patterns affected by three factors, number of cameras, camera frame rate (fps) and data size (resolution). With advancements in recording technology, HD format surveillance cameras are available and affordable for large scale deployments. A storage server must match the data size and complexity of HD cameras setup.

Test results show that Promise Vess A2000 Series NVR Storage Appliance operated with a high degree of stability throughout the test period.

The Vess A2000 Series also achieved high storage throughput with a reasonable level of resource usage.

## Reference

