Best practices for
video management (VMS) design

Architecture & Engineering Specification
Proprietary Milestone Information

Introduction

This document is aimed at all Milestone A&E program members, such as architects, engineers and consultants who specify and design open platform IP video management software (VMS). The A&E best practices for VMS design document highlights considerations that Milestone recommends one take into account when developing successful proposals with open platform IP VMS. This document discusses important design aspects such as storage and server specification, and explains why it is essential to include those requirements in the project design brief and highlights the consequences of not accurately defining the project scope. You will find links to relevant information for designing projects related to these areas. Please note that this list is generic and does not include project-specific items. For further information, please use the dedicated A&E material including the A&E specifications available at www.milestonesys.com/AE (please note that you must log in to access the A&E specifications) or contact our presales department: presales@milestone.dk

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Best Practices

Milestone XProtect Products

In order to select the right product, you should consider the project's security goals and objectives. Milestone XProtect® comprises a suite of software products that are designed for installations of any scale. Each XProtect Version has its own strengths and capabilities designed to meet the demands of particular security deployments. Choosing the optimal XProtect product will involve a detailed understanding of the security objectives to match the functionality required to the appropriate product. Please use the XProtect product comparison chart to get an overview of the features that are included in each product:
www.milestonesys.com/productoverview

XProtect Enterprise and Professional are advanced IP video management software products designed for medium and large-scale installations, primarily multi-site, multi-server deployments. Recommended for installations with a maximum of 250 cameras, Enterprise has the capability to support an unlimited number of recording servers. There is an intuitive management interface for quick response and situational awareness the absence of which would result in the security operator spending additional time to view and control the cameras in a system.

With distributed master/slave recording servers, spread over multiple sites, the load on their central processing units (CPU's) can be balanced, avoiding server overload causing a slowdown in the response of the Smart Client's. Milestone XProtect can be installed using commercial off-the-shelf (COTS) components and hardware, enabling the user to utilize existing infrastructure, which saves money. (NB. XProtect Professional is also available preloaded on the Milestone Husky M50 and M30 NVR). XProtect Enterprise offers you endless integration possibilities with support for the Milestone Integration Platform (MIP), allowing you to integrate

applications yourself or utilize solutions and business systems developed by our ecosystem partners. The software includes the following components: Management Application, Recording Server, Event Server, XProtect® Smart Client, XProtect® Mobile server component, which gives you, access to XProtect® Mobile and the XProtect® Web Client.

XProtect Corporate and XProtect Expert are designed for large-scale, multi-site installations and support an unlimited number of cameras, users and sites. They offer centralized management of all parts of the system, including recording servers, users, storage and devices. Without this centralized management approach, it would be far more time-consuming to manage and maintain the system. There is no need to be physically present at each server for configuration tasks as these can be done in a central location.

The Management Client is the single point of administration for an entire system, including remote handling of servers, devices, and users. System and configuration reporting, including CPU performance is available and the management and the smart client.

XProtect Corporate is also compatible with XProtect Web Client and Milestone Mobile with a 64- bit recording server application, (N.B. more cameras can be connected per recording server than was the case with the previous 32-bit recording server increasing the cost).

Adhering to local laws

If your project calls for conformance with local and/or federal privacy laws, Milestone XProtect provides you with built-in tools to meet these needs. XProtect products include a privacy mask that can be applied by the system administrator. The mask stays applied to any emailed or exported video. There is a statute of limitations in different states or countries that dictates the time period for admissible evidence in a court of law. These will affect the video retention times. It is necessary to review these statutes in preparation for your particular installation.

Evidential Recordings

All versions of XProtect have a general retent ion time function but by choosing Milestone XProtect Corporate, it is possible to have peace of mind when it comes to evidence for a legal proceeding because you simply set up the configurable retention time for cases requiring further investigation, which will meet or exceed the statute of limitations, for your particular region.

Integration

It is entirely feasible for you to use the open platform concept to create your own integration using the software development kit or, quite probably a suitable software integration is available already from our solution partners. Please visit the Solution Finder on our website (www.milestonesys.com/Software/Additional-Resources/Solution-Finder/) to find a suitable solution for your project.

Server Selection

The XProtect product line is adaptable to fit the needs of any size installation when it comes to choosing server hardware. XProtect Corporate, Expert and XProtect Enterprise do not have any limitations when it comes to the number of cameras per server, they are only limited by the hardware specification. The administrator can virtualize servers, allocating the required resources on demand. XProtect can be utilized on a desktop, work-station, or rack mount/blade form factor. You can check the precise specification by following this link; http://www.milestonesys.com/Support/Technical-Support/Product-System-Requirements/

Please use the Milestone Design Tool to estimate your server requirements. The Milestone Design Tool displays a project summary providing you with an overview of your bandwidth and storage needs. In addition, the tool displays hardware recommendations for Recording Servers and XProtect Smart Client. It is available on the Milestone A&E Portal: www.milestonesys.com/AE or www.milestonesys.com/designtool/

For specific hardware requirements or validation, please contact the Milestone Presales Department at presales@milestone.dk

Milestone Husky is a range of Network Video Recorders NVR preloaded with XProtect Professional software with a variety of form factors, camera numbers and storage capacities. There are IP-only models and hybrid models to allow easy connection of legacy analog cameras alongside IP cameras.

You can work out the right Husky Model to meet your needs by visiting this page http://www.milestonesys.com/Husky-NVR/Build-Milestone-Husky/Select-Milestone-Husky/

Video Storage Considerations

Disk performance

An unlimited number of logical or physical recording servers allow the video recording process to run allow-ing for the constraints of disk read/write speed. Milestone's video arc hiving feature moves recently recorded video from high-speed, live video storage volumes to larger, long term video storage arrays as scheduled. To learn more about storage, please read the white paper about Milestone Storage Architecture: http://www.milestonesys.com/Sharepoint/White%20papers/Milestone_Storage_Architecture_with_synasis.pdf

Archive Retention

Milestone has perfected a way to automatically archive long-term video, and set an automatic retention that requires no maintenance once it is set. All products have configurable retention periods for automated, sched-uled archiving. XProtect Enterprise can be scheduled hourly for any number of hours to be archived (every three, four, five, etc.) XProtect Corporate has no limit on how long video is kept in the live database. Limitations are based on the hardware.

System resilience

High availability/failover requirements

XProtect Corporate has high availability, failover and recovery features that make it ideal f or high-risk operations. By supporting Microsoft Server Clustering, XProtect Corporate provides redundancy for the Management Server and the Event Server. XProtect recording servers have software-based failover recording servers running in hot or cold mode. These failovers recording server services run in an active/passive arrangement in separate logical or physical environments to minimize the consumption of storage and bandwidth resources. Failure of the primary recording server to respond to status requests from the failover server will trigger recording on the failover server of some or all of the video channels previously recorded by the primary server as well as responsibility for all other functions. Once the primary server is back online it automatically resumes recording and all other functions. Video stored on the failover server is gradually transferred back to the primary recording server with a lower priority transmission. The video is automatically time synchronized back into the video database so search efforts and playback will not be affected.

Edge Storage

XProtect Corporate also has recovery features in the event of camera disconnection from the network. Compatible third-party cameras with on-board secure digital (SD) storage capability or local hard drives, they can be configured to record to their removable media during. Once connectivity is restored, the missing video is automatically retrieved from the camera and put back into sequence in the video database.

http://www.milestonesys.com/Sharepoint/White%20papers/Milestone_Edge_Storage_with_flexible_retrieval.pdf

Trading Hours

The XProtect software can be configured to work day or night, with recording schedule capability, during daylight (opening hours) and low-light (after hours) business hours.

Reverse Retention

XProtect Enterprise has what is known as law enforcement mode. If this feature is invoked then the recording server will stop recording when it runs out of space. So video is retained permanently.

Hardware Configuration

XProtect systems are highly flexible when it comes to utilizing high capacity external storage, such as network-attached storage (NAS), disk-attached storage (DAS) and a storage area network, (SAN) where available. Video content can be stored on the recording server, but also has the flexibility to be archived elsewhere, to any of the storage options already mentioned.

Supported Hardware

Camera Compatibility

XProtect supports the widest choice in network hardware devices - more than 3000 IP cameras, encoders and digital video recorders (DVRs) from 100 different manufacturers and includes for remote set up whenever the camera supports this feature. XProtect can manage an unlimited number of cameras, either analogue or IP, and resolution is limited only by the cameras specification, and the display hardware. All products software also supports ONVIF and PSIA standards. Video frame rates and resolution up to the camera's maximum are also supported in the XProtect system. To view the list of hardware supported by Milestone, please visit: www.milestonesys.com/supportedhardware

Note; Please remember to choose whether you want to view the supported hardware list for
XProtect Corporate/Expert or the supported hardware list for all other XProtect products.

Codec

Milestone supports a variety of compression standards including the commonly used MJPEG, MPEG-4, and H.264. Milestone also supports MxPEG compression format. Currently, H.264 is the most efficient video encoding standard available today.

Motion JPEG (MJPEG) is a Sequence of still JPEG images that when viewed will give the appearance of moving video. MJPEG is often used in applications where individual frames are required for analysis. MPEG-4 and H.264 are video compression algorithms that use interframe prediction to reduce video data between a series of frames. Essentially, a reference frame is established to which a frame is compared, and only when pixels change compared to the reference frame are the pixels encoded. This reduces the number of pixels that are encoded. Codec selection affects the image file size or video stream bandwidth and therefore storage requirements. The efficient compression that MPEG-4 and H.264 offer gives these two formats an advantage compared to MJPEG. H.264 can reduce the size of a digital video file by more than 80 percent compared to MJPEG format – without compromising image quality. This reduces both bandwidth and storage needs. Heavily coded formats, such as H.264, will also require resource-intensive decoding on the Smart Client and Mobile Client receiving the video streams.

A feature in XProtect Corporate/Expert called adjustable Group Of Picture (GOP) length for H.264 and MPEG-4 codecs, also reduces the video stream size. Some video analytics will only work with certain codecs. Depending on the analytics system chosen you may have to configure the cameras to use a specific video Codec for the analytic to work. It is critical either to check that the camera provides the codec needed or choose an analytic product that can use the codec you want to use in XProtect.

Dual-Streaming

XProtect Enterprise has dual stream capability, with different frame rates, codecs and/or resolutions. It uses a number of remote connection technologies for a third stream to be added for remote viewing.

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Multi-Streaming

XProtect Corporate supports the maximum number of live camera streams available from any given camera. Define which stream to record from, and select any of these streams for Smart Client viewing, even changing on the fly.

Frame rate

Milestone XProtect software facilitates the control of the frame rate retrieved from IP cameras and encoders. Multiple stream support (known as multi-live streaming) from the camera facilitates differing frame rates, resolution, compression and quality being displayed in the XProtect Smart Client. The security operator could be located in an area of high bandwidth utilization and may wish to decrease the frame rate by selecting another stream with a lower frame rate to decrease the CPU load of the XProtect Smart Client.

For optimal performance when capturing motion, the server application has a speed-up option to record at one frame rate per second continuously, and it can increase the frame rate or image quality according to a predetermined time schedule or upon the occurrence of an event. XProtect Corporate allows customization for recording at a particular frame rate during a particular time of day, according to a recurring schedule. In addition, XProtect can reduce the cost of long-term storage with a function called data grooming in order to reduce the overall disc space required.

Fast moving objects

If your project scope involves capturing objects moving at high speeds, Milestone XProtect has no video stream frame rate limitations. A camera with a sufficiently fast shutter speed will be able to capture images with the sharpness required for third-party object character recognition, facial recognition, process monitoring, and/or theft, sleight of hand apprehension, License Plate Recognition (LPR).

Resolution

A surveillance system's effectiveness decreases in the absence of appropriate detail. Milestone XProtect allows you to select the most appropriate camera for the particular application you have and deploy a mix of camera resolutions and frame rates to ensure that the desired level of detail is captured. Video surveillance gathers and stores visual data, and these higher resolutions provide the detail necessary to investigate observed incidents.

Image complexity

In a Milestone XProtect system, it is possible to account for the degree of expected movement in a given scene, which would be needed to trigger a video motion detection event to create tailored event triggering according to the time of day or the location of the view.

Network

Bandwidth Management

Whether single streaming, or dual streaming from a camera, Milestone XProtect controls bandwidth centrally via dedicated camera drivers. Resolutions and frame rates are adjustable per camera per recording schedule to manage bandwidth.

Bandwidth per recording server

Milestone XProtect can stream in high-quality H.264, reducing the bandwidth required to connect to each recording server for a given number of cameras.

Bandwidth control between client and recording server

Relevant particularly when connecting over the Internet, Milestone uses techniques to control bandwidth between the client and recording server such as down speeding-, which is the reduction of frame rates to reduce bandwidth when viewing video. Down sampling is also available, to reduce the stream to a lower resolution, when it is necessary to save on bandwidth in WAN or mobile surveillance environments.

Network segmentation and security

To ensure the delivery of data on the network and reduction in packet loss, Milestone XProtect systems can be segmented to have a separate client network and a camera network. Multiple physical network interface cards (NICs) can also be set up for more segmented transmission paths to increase the amount of data throughput. This lowers the bandwidth utilization for each connection, allowing for higher capacity. Milestone utilizes a secure HTTPS connection to cameras, which support this feature in public networks, and has the ability to connect to cameras in other subnets. The system integrator can also segment ports on a switch, into separate VLANs to prevent network crossover.

Automatic device detection

Milestone XProtect has advanced automatic device discovery and automatic camera addition, scanning for IP address ranges of cameras. A user can add as many network ranges as needed, when adding cameras to the recording server. This adds a critical timesaving dimension, for faster device detection in your system.

Smart Clients

An unlimited number of displays can be used for viewing, in an XProtect system featuring one of the highest number of cameras from a single interface arranged in 38 defined layouts. This may reduce the need for multiple client workstations with consequent savings in additional hardware installation and configuration. It is fast and easy to download our client, with no licensing file being required.

XProtect Smart Client Requirements (Stand-alone)

The XProtect Smart Client can run on almost any workstation with an appropriate operating system. See the XProtect specification sheets)

Case Studies

To learn more about how XProtect is used in different industries, please read our customer stories: www.mile-stonesys.com/Company/Additional-Resources/customerstories/