

IP Video Surveillance Solutions in Harsh Environments

How to successfully install and manage ruggedized IP video surveillance solutions at remote sites.

Milestone White Paper

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Introduction

As the overall security industry continues to move towards Internet Protocol (IP) based video surveillance, the possibility of deploying video surveillance solutions in harsh outdoor and often remote environments has been met by strong customer demand. For this reason, many integrators are being forced to learn how to design and install reliable systems in remote outdoor situations. This learning curve is not without its challenges.

A typical indoor system involves items such as Milestone XProtect™ software, IP cameras, Category 5 (Cat-5) wiring, servers, routers, switches, and storage devices. Generally speaking, all of these items have been designed to be installed and operated in a room temperature (controlled) environment with easy access to each system component. Planning a remote outdoor or mobile installation however requires many additional aspects to be considered for the installation to be successful.

With remote outdoor situations, the typical infrastructure that is available for an indoor solution often does not exist. For example, there may be no AC power, no hard-wired communications and certainly no temperature-controlled environment. Faced with these challenges, that affect both the design and installation of solutions, the following questions must be addressed:

- How to select ruggedized equipment?
- What power options exist?
- How to store video and manage a distributed system?
- What can be done to plan for system reliability?

This White Paper provides answers to these questions and identifies many of the challenges that must be considered when installing video surveillance equipment in remote, harsh environment areas.

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Authors:



Eric Fullerton, President, Milestone Systems Inc., the world's leading developer¹ of open platform IP video management software.



Kyle Johanson, Vice President J-Systems Inc., helping organizations design, acquire and implement customized surveillance solutions for harsh environments.

www.J-Systems.com

¹ Source: "The EMEA and World Markets for CCTV and Video Surveillance Equipment" IMS Research reports from 2004 & 2005 (published 2006).

Selecting Ruggedized Equipment

The first question many people ask is why not simply install indoor rated equipment in temperature controlled enclosures. Often this is an approach integrators take, mainly because it represents the least-cost solution.

Many video products such as cameras, power zoom lenses and video encoders, although not designed to be deployed outdoors, can be installed in temperature controlled enclosures. However, there are hidden costs that come with heating and cooling these enclosures, for example, increased demand for power from alternate power sources (such as solar power). To reduce this demand for power, it is important for the system designer to select equipment that does not require a temperature controlled environment.

Here are a few key specifications to look for when selecting ruggedized equipment for remote outdoor applications:

- Shock and vibration
- Operating temperature range
- Heating or cooling
- Moving parts
- DC operating voltage range
- Waterproof, dust proof, salt-spray and corrosive environments

Shock and vibration: important for mobile applications, only select equipment that meets specifications for mobile or portable rapid deployment.

Operating temperature range: select equipment which can operate over a wide temperature range, for example -30°C to +70°C or better.

Heating or cooling: select equipment that does not require heating or cooling, particularly when considering solar power.

Moving parts: designing a system without moving parts improves reliability. If you have to use components with moving parts (pan-tilt heads, power zoom lenses etc.), verify with manufacturers that specifications meet requirements for harsh environments (temperature, humidity) and that they contain proper lubricants (will not evaporate or freeze).

Direct Current (DC) operating voltage range: is a key consideration for solutions with alternative energy sources such as solar, generator, battery, or automotive deployments. Equipment that only operates using Alternating Current (AC) power is a poor choice for remote applications unless utility AC power is available. Even if this is the case, you may require a backup DC Uninterruptible Power Supply (UPS) or solar power system. These solutions will require an inverter to supply AC powered equipment.

Waterproof, dust proof, salt-spray and corrosive environments: equipment installed outdoors has to be waterproof. If cooling fans are used, filters will be required to keep dirt, dust and flying insects out. Salt-spray and other corrosive environments may require stainless steel enclosures.

Power Options

Providing reliable power is one of the most overlooked aspects of installing equipment in harsh, outdoor environments. In a typical indoor video surveillance system, AC power is readily available, in many remote outdoor projects obtaining power is a primary concern.

It is rare that AC power is available for outdoor projects and it can be very costly to obtain a power drop from a distant utility pole or ground vault. In the majority of cases the only power sources for outdoor projects are:

- Solar
- Generator
- Batteries

The drawbacks to diesel powered generators and batteries are obvious (refueling, recharging) leaving solar power as the most cost-effective alternative. It is environmentally friendly (“Green”) and requires little maintenance.

When using solar power, it becomes important to select equipment that can operate on 12 V DC or 24 V DC. Solar power is typically used in combination with banks of batteries and the surveillance system is designed for minimal power consumption. Every watt of power saved translates into cost savings and reduced physical size of the overall solar energy system making it easier to install.



Depending on conditions an alternative to solar power might be thermoelectric generators that run off propane. This of course will require a propane tank to be located near by. The tank will have to be refilled from time to time and such regular maintenance may not be practical for extremely remote sites.

Sometimes there is no alternative to an AC powered device and in this situation a DC to AC converter can be used to provide AC power from a DC supply.

Note: DC to AC converters are not 100% efficient and are likely to increase the power rating required from the DC supply.

Communications Options

Depending on the location and communications services accessible in the location of the project there are a variety of communications options that may be available.

- 802.11x wireless
- Digital Subscriber Line (DSL)
- T1/Frame Relay
- Cellular
- Satellite

802.11x Wireless: is an excellent choice for short-range, line of sight situations. With the proper planning, an accurate site survey and the correct antennas, this solution can deliver high frames-per-second (fps) video from a remote location to an area that has a high-speed wired connection.

Digital Subscriber Line (DSL): is another good solution for remote locations. However, DSL service can be hard to find in remote areas and local service providers may require a long time for installation.

T1/Frame Relay: provides reliable, high-speed backbone communications capability. Unfortunately, T1 links are rarely an option in remote regions.

Cellular: is becoming more attractive as wireless network carriers expand their high-speed data services. The two different cellular formats that exist are CDMA and GSM, both of these formats have their advantages and disadvantages and the format you select will depend on your needs. A cellular connection can deliver good performance for transmitting low FPS video across networks.

Satellite: is a last choice when all of the above options won't work. Communications can be achieved nearly anywhere on the planet using a satellite uplink however, the cost of the service is very high and usually makes this a poor choice unless there are absolutely no viable alternatives.

Video Storage and Management

With any video surveillance system the management and storage of video is a critical element. For remote sites, video storage and centralized management are by far some of the most complex and difficult issues to manage. Typical Network Video Recorder (NVR) systems are generally built around existing server room equipment. Much of this equipment, including servers and storage arrays, was not designed for alternative power sources such as solar, or for installation in harsh environments.

One of the difficult design decisions is the recording solution. Do you record locally at the remote site, or record at a centralized monitoring

facility? If the remote system has limited bandwidth as with cellular or satellite, then local recording is the only logical choice. When a T1, DSL or 802.11x are available, recording at the remote location is still a viable solution, however, depending on the system architecture, this might not be the most effective approach.

When recording locally at a remote site that is operating on solar power, a low-power, ruggedized computer system will be required. To maximize reliability the system should have an embedded operating system that can restart automatically is critical.

To meet out door specification requirements the computer must be temperature complaint, shock, dust and potentially water-resistant. Typically this type of equipment is designed for military purposes, very specialized and can be difficult to find at a reasonable price.

When considering video management software Milestone XProtect Corporate is an ideal solution for remote outdoor systems. In large distributed applications, recording servers can be installed locally, the management console can connect through the internet to manage the system and XProtect SmartClient viewers can connect to view live and recorded video. With this type of functionality the administrative overhead in managing a remote installation can be kept to a minimum.

For geographically distributed systems Milestone XProtect Central enables you to monitor the entire system from an alarm and incident perspective using cascading maps. The features include managing alarms and monitoring camera status to alert security staff if a camera goes off line. Having a central management console at a single location with a visual display of alerts, components and their status makes it much easier to manage a large distributed system.

Planning for System Reliability

When ruggedized equipment is deployed outdoors in potentially harsh, difficult to reach locations, system reliability is crucial to maintaining efficient operation and effective cost management. If the equipment is frequently off-line because of failure, or requires continual maintenance, the cost of operation will rise quickly. Reliability can quickly become a problem when indoor equipment is used in an outdoor enclosure. Some of the typical problems seen are, excessive power consumption when solar power is used and heater, fan or thermostat failures after 12 to 24 months operation.

The most critical element that affects reliability is the computer system and software. Scalability, reliability and local support are essential ingredients for the solution to perform reliably and without maintenance over an extended period of time.

The following checklist gives you some of areas that are important to consider in designing reliable solutions for outdoor implementations:

Basic preparation & planning: points to consider when setting up the project:

- Careful design, planning and installation
- Utilizing ruggedized equipment (within manufacturers' specifications)
- Limit moving parts and heat build up to a minimum
- Be fully prepared when you go to the remote site
- Observe installation instructions

Video Management Software: select software that is proven and reliable in operation, stable and scaleable. It must be easy to scale the software as the needs of the business or organization change. Verify with manufacturers that their software has been proven in multiple installations and most of all, works well in your solution.

Cabling: use of proper outdoor rated cable. Environmental elements such as UV, ice, snow, blowing sand, rain can break down the jacket of indoor rated cable. Over time it will become brittle and eventually crack allowing water to penetrate the cable and eventually fail. Outdoor cable must also be protected from animals that can chew through cable jackets. Depending on the environment it may be necessary to protect cabling in metal conduit or bury it.

Grounding: proper grounding (or earthing) is crucial. If the equipment is installed in an area which is prone to lightning, proper grounding along with surge protection devices will help to prevent damage to cameras, radios and computers from nearby lightning strikes.

Note: nothing will protect equipment from a direct lightning strike.

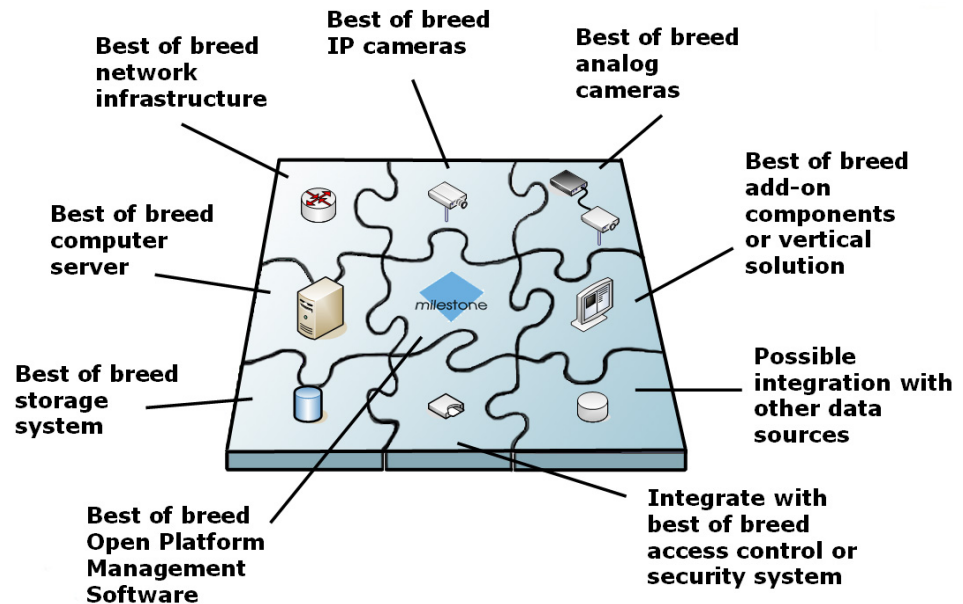
Connectors: always use waterproof connectors. Many failures in outdoor equipment can be traced to connectors, either the wrong connectors were used or they were incorrectly installed.

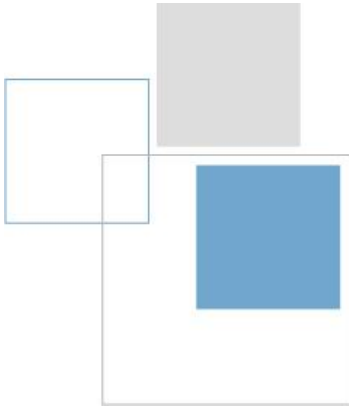
Milestone Systems

Market leader. Milestone Systems is the global market leader in open platform IP video management software. Milestone's XProtect products operate as the core of your surveillance systems: connecting, sharing and managing all devices through a single interface that is easy to learn and operate.

Easy to use. The XProtect platform is easy to use, proven in operation and scales to support unlimited devices. XProtect products support the widest choice of network video hardware and are designed with an Application Programming Interface (API) that integrates seamlessly with other manufacturers' systems.

Best-of-breed. Using XProtect, you can build scalable, "best of breed" solutions to video enable your business, reduce cost, optimize processes, protect assets and ultimately increase value in your company's products and services.





Milestone is the global market leader for open platform IP video management software. Our XProtect™ platform is easy to use, robust and proven in operation at 25,000 customer installations around the world.

With support for the industry's widest choice in network hardware and seamless integration with other systems, the XProtect range gives you best-of-breed solutions to video enable your business, reduce costs, optimize processes, protect assets and ultimately increase value in your company's products and services.

Milestone solutions are sold through authorized partners in 62 countries.

Office Locations:

Milestone Systems A/S (Headquarters)

Banemarksvej 50, 2605 Brøndby, Denmark
Tel: +45 88 300 300

Milestone Systems DE

Am Kleefeld 6a, D-83527 Haag i.OB., Germany
Tel: +49 (0) 8072 442173

Milestone Systems Inc.

12725 SW Millikan Way, Beaverton, OR 97005, USA
Tel: +1 (503) 906 7910

Milestone Italia Srl

Via Giovanni da Udine, 34, Palazzo E, 20156 Milano, Italy
Tel: +39 02 3809 3206

Milestone Systems Japan

c/o Royal Danish Embassy, 29-6, Sarugaku-cho, Shibuya-ku, Tokyo 150-0033, Japan
Tel: +81 (0)3 3780 8749

Milestone Systems Pte. Ltd.

30 Robinson Road, 13-03 Robinson towers, Singapore 048456
Tel: +65 6225 2686

Milestone Systems UK, Ltd.

118 Codnor Gate, Ripley, Derbyshire DE5 9QW, England
Tel: +44 (0) 1773 570 709

Corporate website: www.milestonesys.com

