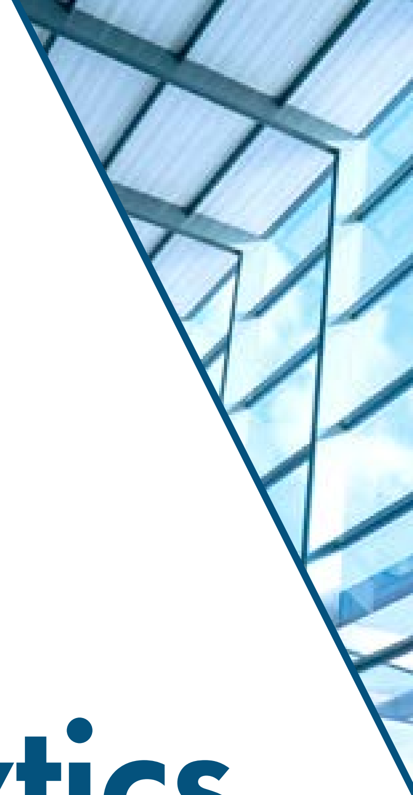

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Video Analytics Design Guide

Considerations for Video Analytics in Security Camera Design Planning

Intro

Many organizations have hundreds, sometimes thousands of security cameras deployed around their campus or throughout their offices but fully utilizing the video streaming in from those cameras can be a challenge. Often they do not know what is happening until after an event has occurred and the cameras simply provide evidence after the fact. Vintra's server-side analytics software allows these organizations to make their existing cameras "smart," delivering accurate alerts and fast video search that can be flexibly deployed on-premise or in the cloud. With its flexible licensing and advanced analytics software that can work on almost any camera, fixed or mobile, Vintra makes it easy to deploy next-gen AI analytics on existing security camera networks.

While AI-powered algorithms are continually expanding the kinds of cameras, fields of view, and resolutions The performance of video analytics can depend on the installation of cameras and scene details. While Vintra will perform well on most any camera, it is important to ensure new deployments are architected for optimal analytics performance.

Systems integrators, and larger end users, are often familiar with camera design concepts like using pixel-per-foot calculations to ensure adequate details will be achieved, or using a lux meter to select the camera with the proper low light capabilities for a scene. However, designing for optimal analytics performance is not often thought of, particularly if analytics are not going to be part of the initial system deployment. This guide is intended to offer advice for ensuring surveillance camera designs are ready for analytics use cases, now, or as future additions.

A few of the topics covered in this design guide :

1. Distance to area of interest and related lens focal lengths
2. The height and angle of the camera
3. Ambient lighting of the scene
4. Network and camera codec settings

DISTANCE TO SUBJECT - With the variety of lens options, and high-resolution sensors available today, it is possible to achieve clear and detailed images of areas of interest at several hundred feet. However there are challenges with long range imaging such as small vibrations or movement at the camera becoming amplified over the distance and making the image shaky, and increased possibility of an object coming between the camera and the far end of the field for view, thus blocking the camera's view. Additionally, in outdoor applications, weather conditions, such as rain or fog, can reduce the working range of the camera.

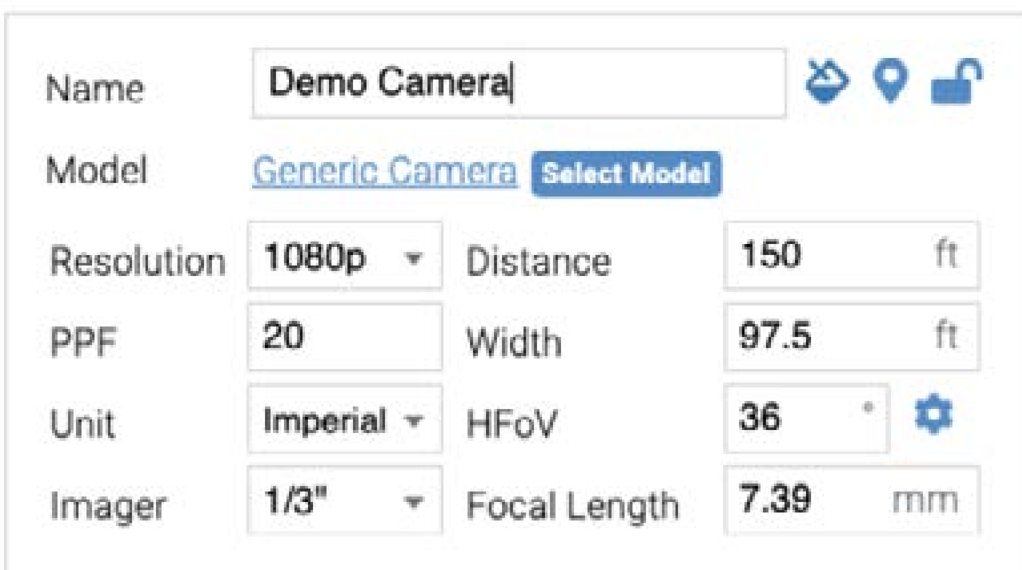
For most applications, limiting camera to subject distance to 200 feet or less will provide the greatest flexibility in camera sensor and lens combination options, and reduce chances of interference from vibrations at the camera, or other environmental conditions from impacting the quality of the scene.

FIELD OF VIEW WIDTH - Many analytics platforms will specify minimum or maximum sizes for objects in the field of view (FOV). This will often translate to determining the overall field of view FOV parameters.

In many designs, camera mounting locations may be limited due to availability of power and data at the proposed location, existing mounting points on buildings or poles, and similar factors. Additionally, required coverage distance is also a key driver in system design. Rarely will objects in the scene be too large, instead they may be too small to be reliably classified.

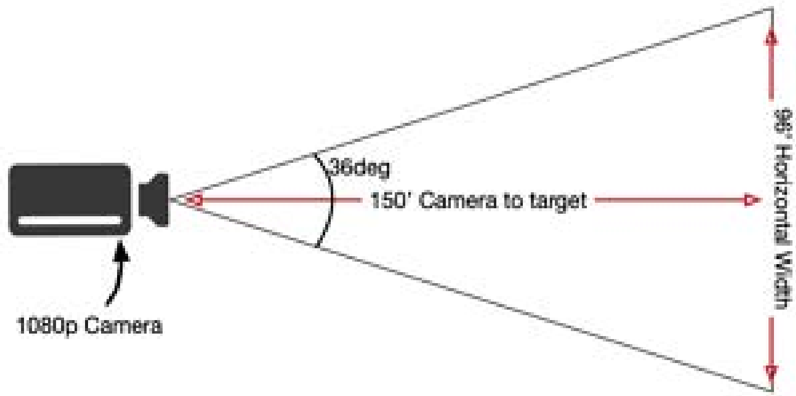
This translates to FOV width ultimately being a factor of the requirements of the analytics system for minimum object size or pixels on target details relative to the distance being covered by the camera.

As an example, if you are using a typical 2MP camera with a 1080vx1920 pixel resolution, and your anticipated analytics package requires a minimum of 20 pixels per foot horizontally on an object for classification, then your maximum field of view width would be: 1920 / 20 = 96 feet. If we want to detect objects at a distance of 150 feet, this would require a lens focal length of ~7.39mm.



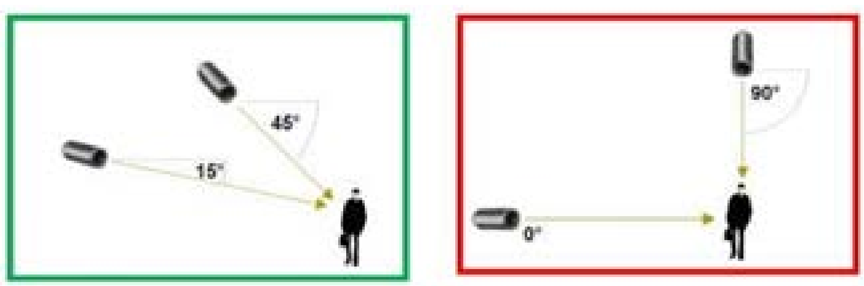
There are several lens calculators online that can assist in computing the required lens focal length to meet a specific pixels per foot metric at a given distance. The above example was taken from the IPVM Calculator Tool.

1080p Camera FOV



WIDE ANGLE OR FISHEYE LENSES - Cameras that offer 180- or 360-degree lenses have become popular in recent years, particularly for indoor locations like corporate lobbies, common areas of commerce. and break rooms. However, these cameras often output images with significant distortion, which can often hinder analytics performance, as the image geometry is not uniform. Some models allow the user to define additional Real Time Streaming Protocol (RTSP) streams that are automatically dewarped, providing a normalized view that analytics can better interpret. If your designs incorporate these kinds of cameras or lenses, ensure your analytics platform is compatible with them.

CAMERA TILT ANGLE - This refers to the degree of downward tilt of the camera in relation to the ground. For example, a camera angle of 0° means the camera is pointed in a line parallel to the ground/ceiling and a camera angle of 90° is pointed straight down. For many analytics platforms, a tilt angle between 15 and 45 degrees will offer the most reliable performance for general object detection.



However, for face recognition applications, a tilt angle of 0-15 degrees will be more effective, giving the camera the ability to capture a clear view of faces for comparison.

CAMERA MOUNTING HEIGHT - For general detections, you will typically want the camera to be at least 6 feet above the objects you want to detect and classify. This helps to minimize objects blocking each other from the camera's view in crowded scenes. Thus, for person or vehicle detections, this will commonly translate to a mounting height of 12 feet or more.

Note that as mounting height increases, and minimum tilt angle recommendations are maintained, the blind spot area under the camera will also increase. While there is no theoretical maximum height, in practical applications, mounting heights of more than 25 feet are usually not recommended.

For face recognition applications, optimal mounting height will generally be 6-9 feet, so that minimal downward tilt angles can be used. This provides more direct views of subject faces, increasing recognition capabilities.

RESOLUTION, IMAGE COMPRESSION AND STREAMING - Transmitting high resolution images at high frame rates translates to increased use of network and storage resources. While these resources have become cheaper in recent years, they are still far from free. To help combat these costs most camera manufacturers have begun offering advanced CODEC options to reduce network bandwidth and storage needs.

Any analytics system will need a minimal number of frames per second and resolution in order to analyze the video feed from a camera. When setting up stream profiles in your camera, or when calculating bandwidth and storage requirements, ensure that you are able to meet anticipated requirements for analytics systems.

Generally speaking, higher resolution images will require more bandwidth to transmit and more processing power for the analytics to process. However, modern analytics platforms do not need the higher resolution to perform to spec. It is important to work with your analytics provider to make sure you have the optimal resolution for the analytics without overburdening the network and GPUs that have to transmit and process the images. Perhaps counterintuitively, sometimes, it is wise to send a higher resolution image to the recorder and then have a lower resolution used for the analytics processing, especially if it is for general object detection use cases.

Ideally, your analytics platform will be able to maintain accuracy at reduced resolutions and frame rates to help mitigate resource needs, and reduce overall cost of operation for the surveillance system.

ALWAYS TEST ANALYTICS IN YOUR ENVIRONMENT AND ON YOUR VIDEO

Don't take your analytics vendor's word for it, make sure you can try their tech on your own video. Make sure to ask them how their technology performs on accuracy and speed when using common validation data sets like KITTI and against open sourced algorithms like SSD and YOLO. While these acronyms may seem unfamiliar now, the industry is changing and they're the equivalent of FPS and PPF in the camera business and those responsible for future camera deployments should familiarize themselves with these terms.

Need More Information?

Do you need help developing a business case to upgrade your security system? If so, let us help. Our team at Vintra can help to ensure that your system design is able to deliver your desired results, and help increase the overall efficiency and intelligence of your existing camera system.

Vintra has put together a hub of resources to help security leaders. Check out our Security Resource Center for case studies, white papers, product videos, industry trends, and more.

To contact a Vintra representative, please submit an online request.

Learn more at vintra.io