

## IP versus Analog

Dated: September 2012



## IP Versus Analog

There is much discussion in the CCTV industry about the pros and cons of IP (Internet Protocol) cameras and the 'inevitable demise of analog systems'. Yet today, some years after the arrival of IP technology the death of analog cameras has not materialised. In fact, in the region of 80% of all CCTV deployed remains analog today. This section of the paper tackles the reasons for this.

In addressing the discussion around IP and analog cameras we will review the definition of each and the key benefits and constraints of each against the typical user requirements of quality and practicality.

**IP Cameras** – IP cameras, capture, digitize and processes analog images, encode them internally and then transmit the captured video digitally over an Ethernet connection to a computer or similar device.

IP Cameras may utilise either a CCD (Charged Coupled Device) or CMOS (Complementary Metal Oxide Semiconductor) and are available in all typically encountered surveillance devices and platforms.

The main physical difference between an IP camera and an analog equivalent is that an IP camera usually has an on board web server meaning the camera can be accessed and controlled over any IP network (WAN, LAN etc). This means that an IP camera can be placed anywhere on a user's network from which its video output can be accessed. As a 'network appliance', an IP camera can be placed anywhere on the network; will have its own IP address and will require maintenance.

**Analog Cameras** – Analog cameras capture video imagery utilising a CCD sensor which then digitizes the image for processing. Before this imagery can be transmitted, it is then converted back to analog for receipt by an analog device such as a monitor or recorder.

Contrary to IP cameras, analog cameras do not interact directly on a network and require no technical maintenance. Utilising analog cameras does not, however, mean that the cameras or their output are not potentially available on or over a network – these features are achieved in the control and /or recording equipment.

### CCD & CMOS

Both IP and analog cameras use an analog image sensor; either a CCD or CMOS. It is widely understood that CCD image quality is significantly better than CMOS. Analog cameras use CCD whilst some IP cameras use CMOS.

## The Pros & Cons of IP & Analog cameras

### Feature/Requirement

#### Video Quality

**IP**

IP Cameras excel in capturing high definition, megapixel images but have trouble with low lighting conditions. Dropped frames and video artefacts are commonly seen in IP CMOS cameras.

IP Cameras are limited in encoding resources, As a result choices have to be made with respect to codec, frame rates and quality with compensating compromises being required.

As the video is compressed before monitoring, you are never able to have the highest quality real time images. Encoding at the cameras introduces latency which is often an issue with PTZ and video/voice operation.

**Analog**

Analog CCD cameras perform well across a variety of lighting conditions and manage motion well.

Analog cameras do not have capabilities above the NTSC/PAL standards.

Because the analog signal is compressed in the DVR where there are more resources available (hardware and software) higher frame rates and better quality of video is typically achievable.

Analog Cameras transmit the video uncompressed to the DVR where it can be viewed live with no latency.

#### Cabling Infrastructure

An advantage of IP cameras is the ability to use an existing network infrastructure to support a surveillance system. Network wiring limits the total distance from switch to camera to 330 feet.

Structured cabling is capable of transmitting power (PoE), video and data.

Historically analog camera architectures utilise coaxial cables. Today alternatives are available (such as baluns) which can enable the transmission of video, power and data over a network wiring infrastructure. It is also possible to transmit video well in excess of a mile and power over 1000 feet and these figures can be extended further still on standard Cat5 cabling.

#### Video Transmission

IP traffic is prone to disruption and this can cause interruption to and loss of video data.

Typical faults such as bandwidth limitations, network congestion, varying bit rates, large file sizes, load balancing, viruses and latency can cause transmission failure and/or degradation.

Analog video traffic is not subject to any networking issues or risks. The bandwidth is virtually unlimited. It is a passive connection that cannot be affected by problems that are outside the immediate surveillance infrastructure,

#### Fault Tolerance & Reliability

While some IP cameras can store limited amounts of video internally, network failure will result in losing all live viewing and the video recorded on the server.

There are ways to limit this exposure but they add management, cost and complexity overhead.

Networks are also vulnerable to viruses and malware – the impact of these can be catastrophic.

The impact of failures in an analogue system is limited to the component direct relating to the failure. Because of this, a camera of connection failure will only have a local impact and will not affect the performance of the rest of the system.

The video transmission is typically a 'passive' connection and as such, once installed, will require virtually no management.

Analog cameras are very mature and boast a long track record for reliability and resilience.

<p>Security</p>	<p>IP video streams can be encrypted and are difficult to intercept. Conversely, the network itself is vulnerable to viruses and intrusion. Intrusion and device hacking are a very real threat.</p>	<p>Analog signals are less secure than IP. But to be accessed they can be hacked and the video viewed by anyone that has access to the cabling infrastructure. With the possible exception of the DVR, the entire system is secure from/immune to viruses.</p>
<p>Maintenance</p>	<p>An IP camera is a network appliance and requires continuous 'skilled' management. The operational expense of an IP camera solution should be carefully assessed prior to committing to an IP solution.</p>	<p>Once installed Analog cameras require no maintenance. They will either work or not but once operational do not require the same 'management' as an IP camera.</p>
<p>Wireless</p>	<p>IP Cameras have good inherent flexibility for integration into a wireless network.</p>	<p>Analog cameras use radio frequencies to transmit video wirelessly. As such they are limited in quantity before they reach capacity in the unlicensed spectrum.</p>
<p>Installation</p>	<p>IP cameras require some basic networking skills for small installations and significantly more for enterprise level systems.</p>	<p>Analog cameras require little or no network skills for installation and configuration. Installing and configuring an analog system is typically far easier.</p>
<p>Compatibility</p>	<p>IP cameras require a network video recorder (NVR) or browser that will communicate with each particular model of camera, which is proprietary and unique. Each time you add a camera you have to make sure that the NVR supports that particular model. An NVR may also support only a limited number of cameras from a particular manufacturer. This issue can make future proofing and supportability of an IP Solution problematic.</p>	<p>Any analog camera can plug into any DVR. There are no compatibility issues when changing either a DVR or a camera.</p> <p>Note: There are many DVRs available today that allow hybrid operation (seamless communication and management of both IP and analog cameras utilising a common software interface.</p>
<p>Obsolescence</p>	<p>IP Cameras are considered immature in a well-established market. With only 15% market share there is no doubt that IP cameras will be developed significantly with added features and benefits however these developments will generate a perpetual supportability challenge for NVR producers and users alike.</p>	<p>Analog cameras have a well-established pedigree and are a thoroughly mature video capture Solutions. Analog cameras dominate the market with an 85% share and for this reason they are and will continue to be extremely well supported.</p>
<p>Scalability</p>	<p>An IP camera solution is potentially limitless in scale with new cameras easily added through spare network connections. There are bandwidth and enterprise level infrastructure considerations for significant expansion.</p>	<p>Analog cameras systems can be expended as required so long as the infrastructure will support it. Bandwidth issues will not be felt as the analog system is not restricted by network capacity</p>

## Cost

- IP cameras can be significantly more expensive than analog equivalents
- There are per camera/channel licensing costs for connection to the NVR
- For large scale deployments, there are costly network switches and peripherals required.
- Through life management costs are comparatively extremely high.

- Analog cameras and their peripheral equipment are significantly cheaper than the IP equivalent
- There is virtually no peripheral equipment required to support and analog surveillance system
- Through life costs of analog systems are significantly lower than for IP due to the latter's requirement for network maintenance

## Summary

High definition and enterprise (ie large scale) wireless systems are main strengths of IP cameras over analog. For most other CCTV applications analogue cameras:

- Offer higher quality imagery (especially in motion and low light and poor visibility)
- Easier to install and configure
- Easier to manage and maintain
- Offer greater versatility (there is potential to convert an analog signal to IP for remote management and viewing if/as required)
- Are a far less risky proposition given their ubiquity, proven capability and protection from obsolescence

Significantly more cost effective

# VIT Company Profile



Within the world of covert and visible surveillance systems, VIT offers unique capabilities as an innovative designer and manufacturer of products and systems and as a specialist consultancy company. Our unique ultra-low-light and fog cameras are VIT's world beating technology

From individual handheld covert video recording systems to fully integrated multi-camera installations VIT Security Group repeatedly delivers exceptional capability at excellent value to its clients.

## Longview 2

### Ultra Long Range Surveillance Solution

- 6 – 100x optical zoom enabling detection of people to 7km+ and ships and larger objects to 30km+
- High contrast through fog visibility
- Ultra low-light performance (down to 0.00003 lux)

## Equaliser RDK

### Rapid Deployment Digital Video Recorder

Optimised for 'real world' deployment, our highly effective 4 channel DVR offers a versatile solution to field deployed operators. Key Features:

- Rapid hot-swappable storage drive
- Instant laptop replay & editing
- Ruggedized for all-weather and terrain

## DARKview

### Our Ultra Low-Light Cameras

Military grade [analog] camera technology offering clear workable images at starlight with no illumination and the ability to 'ignore' and see beyond bright lights.

## DARKview HD

### Low light Megapixel Camera

Astonishing HD quality imagery at night and in colour with our 2 megapixel HD camera. This camera offers the benefits of an HD IP camera with some of the characteristics usually associated with the best analog cameras.

## FOGview

### Superior Quality Imagery Through Fog

Our range of high contrast fog cameras utilise unique and proven technology to see in all low visibility conditions including snow, sand, dust, mist and rain.

## SHARPview

### GBO - InfinityLens™

The InfinityLens™ enables a focus from a few centimetres to "Infinity". This means the InfinityLens™ has extreme telephoto to wide angle capabilities, making it an ideal product for precision and high value security installations.

In practice, a single installation of an InfinityLens™ has the ability to provide extreme focus surveillance for a wide area over significant distances. The "Deep Field Focus" capabilities of the InfinityLens™ are unique.

# Seeing is Believing...

VIT has customers across the globe serviced by regional partners

