



I'm sorry I think you're wrong.... and here's why

(Fovea: 'a small depression
in the retina of the eye where
vision is sharpest' OED)

Controlware Country Manager Mark Harraway puts forward the case for
IP CCTV in response to Mike Newton's article in the last edition of Fovea

Mark Harroway puts his finger on the button

Well, he would say that. Wouldn't he?

"Everything that can be invented has been invented."

--Charles H. Duell, Commissioner, U.S. Office of Patents, 1889

I read with interest the article last month by Mike Newton of Dedicated Micros and I have to say that my first thought was one of disappointment, and my second; "Well, he would say that wouldn't he?" I was disappointed that Mike seemed to use the chance to open a really good debate on the future of IP vs. Analogue CCTV as a promotional piece for Dedicated Micros, and also to try and hold back the market in an unhappy compromise of hybrid systems.

The things people say...

"I think there is a world market for maybe five computers."

--Thomas Watson, Chairman of IBM, 1943

I also had a sense of déjà vu when I read Mike's article. In my career I have often heard similar arguments. When I started in the IP field in Data Capture and EPOS (Why would you ever want live data? – Batch processing is always best) through to general IT (What? – Connect every computer in the world to every other one? – Are you mad?), then to Wireless Communications (Why on earth would I ever want to log onto my email or work remotely from a coffee shop?) before coming to rest at present in IP CCTV (No, NVR's will never take off – VCR Tape will always be best). At every step there have, and always will be, those who either cannot or do not wish to see the future but yet tomorrow always becomes today and those who stand still will be left behind.

Speaking as the Country Manager of a Value Added Distributor for IP CCTV solutions and with my experience across a number of IP fields I feel that I should at least try to put the other side of the IP vs. Analogue debate. There are many independent market research reports that state that at some time in the near future IP will replace analogue based solutions as the technology of choice. Even Mike acknowledged that IP is the future, but I think his pitch was slightly skewed by the fact that Dedicated Micros don't have a pure end-to-end IP solution, and indeed no vendor does have the complete end-to-end solution, as it's not the current business model of the market: – Everyone plays to their own strengths be they recording, camera and / or encoder manufacturing or storage / transmission.

However, as the entire physical security market of Intruder, Access Control, CCTV and even potentially Fire, moves to an IP based platform, both System Integrators and End Users will request and expect totally integrated IP solutions.

From the customer's perspective, there are three main deployment scenarios: (1) integrating existing analogue edge components with an IP backbone, (2) migrating existing analogue installations to IP over the life cycle of the system and finally, (3) installing a complete Greenfield pure IP solution that meets the project needs, budget and allows for future proofing.



All these scenarios present challenges in both planning and deployment, but these can be identified early enough to ensure that there are no surprises and the project can be designed, managed and delivered within agreed timescales and within budget.

As explained below, Mike's estimated £1.8M cost for a 750 camera system is wrong and misleading. I would love for a client to be prepared to spend £1.8M on a system, but I doubt such a customer readily exists. I think that Mike has been overtly disingenuous with some of the statements he has made regarding the cost of deployment for his theoretical 750 camera system; and I do not agree with the cost analysis, ROI arguments or system supply figures that Mike has quoted.

Unsurprisingly though, we're in agreement that the end user should never face any hidden costs or the need to deploy a "costly, high speed backbone". But that's never been an IP-related issue in my experience.

Remember the 5 P's – Proper Planning Prevents...

"There is no reason anyone would want a computer in their home."

--Ken Olson, President, Chairman and Founder of Digital Equipment Corp, 1977

The secret to successful IP solution deployment lies in acknowledging two simple factors: (1) fully understanding

the concept and requirements of system design for IP including how everything fits together and (2) how and where to source all the correct components from multiple manufacturers.

When looking at any of the three deployment scenarios above there are different challenges to each with regard to existing system components, so it's worth looking at any additionally required components and responding to some of Mike's comments.

It should be noted that through good system design each project model can be deployed in a number of ways – central storage, distributed storage, redundancy, failover and remote high quality recording with low quality live view are all possible. These solutions can easily be implemented across existing infrastructure (without impacting IT services such as email, IP telephony or data processing applications), or new IP CCTV deployments with the use of networking functionality such as VLAN's (the ability to create separate "virtual" LANs on the same switch) or by utilising low cost switches to create a separate LAN for the surveillance system.

However, I struggle to understand Mike's concept of requiring 211 servers to run video analytics. Video analytics was one of the most over-hyped features of IP based video post 9-11. It was to be the Nirvana of video solutions allowing us to spot and identify suspects' faces, track suspicious behaviour and generally replace the need for CCTV operators. Sadly this is not yet the case. That said, however, video analytics has made great strides forward and does have a key role to play in the future of IP CCTV. Today it is possible to analyse video for incorrect motion or direction, loitering, left or removed objects and a host of other functions very accurately. In the past this did require a low camera feed to server ratio due to the limitations of the hardware platforms however with the improvements in processor and memory technology this argument no longer holds water as most IP camera manufacturers are looking to deploy analytics on the cameras or encoders themselves to reduce this server loading.

Some of the technologies Mike references such as Transcoding are available to a number of vendors within the IP or NVR space so this should not be seen as a unique feature of a Dedicated Micros based solution but there are a number of features available to IP solutions that are not available to hybrid solutions such as intelligent maps, integration with other systems such as Access Control or multi site co-locations.

Building the perfect system

"I used to think that cyberspace was fifty years away. What I thought was fifty years away, was only ten years away. And what I thought was ten years away... it was already here. I just wasn't aware of it yet."

--Bruce Sterling, Science and Technology Author, 2000

In order to dispute Mike's assertion that a 750 IP based camera system would cost £1.8m compared to Dedicated

Micros £250k or £600k solution, I have to make a few assumptions concerning the system proposed by Mike.

Mike hasn't provided a detailed system design in his cost comparison model, so we've put forward a high-end solution proposal as follows:

- 750 camera feeds
- 31 days retention of footage and a 10% additional archive for incident recordings.
- All streams to be recorded 24/7/365 at 4CIF / D1 at 25fps
- Recordings are of average motion of 50% in view at any one time. (Why is this of interest? Different encoding technologies mean that significant savings can be made by only sending changes in the frame rather than a complete refresh every frame. H.264 encoding can offer between 50% and 80% savings over M-JPEG for instance.)
- All cameras are already installed and running via coax to local collection points and then high speed CAT5e or CAT6 cabling needs to be installed back to a central command and control point. There is a difficulty here in that we have no "real" site to work from so the assumption will be made that the cameras are grouped in groups of 16 and are no more than 300m from the central control point on standard runs through existing conduit that would be there for the existing infrastructure or cameras (they all need power, right?)
- As the system is truly mission critical 100% redundancy and failover are required.

Using a leading vendors freely available storage calculator on the above figures the following storage profile is generated (for this example Axis Communications tool was used so readers can check these figures for themselves).

This design tool shows that only 116.2 TB of storage is needed – even when adding the additional 10% overhead for incident recordings (or approx 16 TB), the storage total is only approx 135 TB. It's possible to purchase 16 x 1 TB iSCSI drive units which would mean that you would only need 11 raid arrays running in RAID 5 (I'll cover these terms and the benefits in a moment). Then when we look at the required servers to process and record the cameras, due to increases in processor power and memory, this means you can support on an average COTS (Computers Off The Shelf manufacturer such as Dell or HP) platform 64 camera feeds therefore only requiring 12 servers plus an additional one to handle system redundancy, not the 24 servers required in Mike's solution.

The use of iSCSI (Internet Small Computer System Interface) means that the storage arrays are connected directly to the network backbone thus eliminating the potential for a single point of failure in the traditional DVR route. Should a drive lose connectivity, power or suffer a systems failure then the network control software automatically sees this and starts to record its streams to another array in the stack seamlessly. By coupling this with RAID (Redundant Array of Inexpensive Discs) even in the

event of a drive failure the data is duplicated across multiple discs so that no footage is lost.

So to connect all this up we simply need a good quality switch. A Layer 3 or Layer 4 managed 10/100/1000 switch (Layer 3 or 4 refer to the level within the OSI (Open Systems Interconnection) stack model to determine where the switch manages network traffic. Layer 3 being the network or IP address layer and Layer 4 being the transport or port layer. Think of an IP address as a phone number to an office and then the ports as being your unique extension – If you don't give the port number to someone directly then they have to go through your receptionist and they may not allow certain calls through).

With the above server count and storage arrays you simply need 2 x 48 port switches and the cabling to connect all your remote collection sites. With the cost per port dropping on switches and even with high grade cabling all this could be installed for less than £25k. Even if you had to deploy this over wider areas than other IP technologies, such as secure wireless, still make this a cost effective solution.

This covers our central management and recording hardware. Mike makes no mention of operator stations. Perhaps he assumes to continue to use the old analogue control room? But again to gain the benefits of a true IP solution this could all be easy, quickly and inexpensively upgraded to 60" progressive scan HD screens supporting 16:9 widescreen resolution thus improving image quality, detail and operator experience.

correctly you can build in redundancy through network protocols such as Spanning Tree and OSPF (Open Shortest Path First) to ensure that there is no single point of failure in the network. The use of protocols such as these actually would give you even more availability than a traditional analogue based solution when coupled with UPS (Uninterruptible Power Supplies) and POE (Power over Ethernet).

So even before we discuss other ROI benefits of IP solutions such as POE (reduced cabling costs and installation time), Intelligent deployments (Dynamic storage profiles, redundancy and integration with other hardware systems), or Intelligent Video (analytics integration with other software systems or improved user functionality), we can see that IP is the future of CCTV.

I have seen the future and IP works

"The Web as I envisaged it, we have not seen it yet. The future is still so much bigger than the past."
---Sir Tim Berners-Lee, Computer Scientist and credited with creating the World Wide Web

Using the above specification, the cost of this hypothetical solution - the recording servers, the software, the encoders, the transmission, display equipment and installation and commissioning for a high frame rate IP solution for 750 cameras – comes in at an End User price of less than

'...For a high frame rate IP solution for 750 cameras – comes in at an End User price of less than £500k excluding VAT.'

The most expensive part of an IP CCTV solution will always be the camera licensing, but as this normally is around only £150 per camera (Which is often for life – If you hardware fails you just reinstall.) I don't see this as a major issue.

The final component is simply to then add encoders at the edge to convert analogue signals to IP. With the new ranges of IP encoders from the leading vendors it is possible to convert these streams and transmit them using H.264 at a bandwidth for 16 cameras of only around 12Mbps per group. Again the cost per channel for this is sub £200 so no high costs there either.

To address Mikes promotion of embedded storage on edge devices, while this may seem practical at first, it simply doesn't work in the real world as there is no way to insert this footage back into your central recording software / device due to the need for watermarking and audit trails. Furthermore if you design the network

£500k excluding VAT. The cost would be even lower at 5fps as the storage would be quartered and costs would be reduced on transmission and encoder technology with more cameras supported per server.

The launch of organisations such ONVIF to facilitate open standards in network video, the industry names committed to it, and independent market research from organisations such as JP Morgan, IMS, and Frost & Sullivan showing IP will overtake analogue as the technology of choice should only confirm that the future lies in IP and digital technology.

Just as it did with computing, mobile phones, telephony and television, IP will revolutionise the CCTV industry. The challenge for us all is to adapt to this rapidly changing market and ensure that our customers are able to utilise the advantages IP offers.

The future is here now and IP works.
For more information about Controlware visit www.controlware.co.uk

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Condoleezza Rice, Secretary of State (2005-2009)

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