

Supporting information for consultant's recommendations:

Recommendation 1: Migrate existing CCTV cameras to wireless transmission where this is feasible in preference to existing fibre optic cabling and reduce annual revenue costs

Where there is LOS and it is cost effective and feasible, it is recommend that the Council adopts the alternative wireless transmission option in preference to existing fibre optic cabling and reduce its annual revenue costs.

MSC in conjunction with a specialist wireless provider UK Broadband has carried out an initial Wireless CCTV survey to determine budgetary prices for switching the cameras using BT and Virgin fibre to wireless transmission solution. Once a wireless transmission system is in place all images arriving in the Control Room will be digital/IP even if it is reliant on the use of fibre optic cabling for the long 'back-haul'. It should be noted that where there is no 'Line of Sight' (LOS) for wireless links, it would be necessary if the cameras were to continue to be transmitted and monitored, for these cameras to remain on BT or Virgin Media and revenue charges to continue to be paid.

Advantages and Disadvantages of Wireless Transmission

Wireless CCTV systems have a number of advantages and disadvantages compared to the current fibre optic transmission service from BT and Virgin Media, which are based on direct point-to-point links. It is important to understand these benefits and risks associated with the use of wireless for the transmission of CCTV images.

Advantages of Wireless

There are a number of key benefits: -

- a) Reduced cost of deployment and removal of annual rental costs from BT and Virgin Media
- b) Ability to install an IP network enabling High Definition (HD) and IP cameras
- c) Able to easily relocate whole/part system when/if requirement at that location ceases (linking into the wireless network)
- d) Extend CCTV system at various locations with fast lead times and little disruption
- e) Provide additional camera locations on existing network with little or no extra transmission costs
- f) No expensive Civil Works/duct installation which can later become redundant
- g) Little on-going cost of ownership

- h) Able to relocate Control Room and its receiving equipment 'relatively' easily without major disruption

In addition other benefits include: -

- a) Ability to offer a segregated Wi-Fi service to residents and public in camera 'hot-spots' and combine capital contributions with various departments
- b) Ability to add other "IP" connected devices such as alarm systems, PA systems, Radio Link extensions (shop/pub watch, wardens)
- c) Ability to share service and offer capacity to IT Dept.
- d) Ability to charge third parties for the provision of this transmission service

Disadvantages of Wireless

There are some issues with wireless that need to be considered when choosing to reduce transmission revenue costs: -

- a) With wireless systems cameras are linked to each other in clusters (often 'daisy-chained') where Camera 1 is linked to Cameras 2, which is linked to Cameras 3, etc. If Camera 3 has a power failure or an equipment failure, images from Camera 1 and 2 will also be lost.

The problem can be reduced by: -

- a. Building wireless 'resilient rings' (especially on the 'main trunk routes) so that one break in the wireless network does not cause loss of any camera
- b. Ensuring engineers have spare parts and are on a responsive call-out maintenance package to restore failing services reduces this risk
- b) The cost effective wireless links operate on unlicensed radio frequencies. This means that another user of wireless could, by accident or intentionally, cause interference on the camera images by using their own wireless equipment in the same area.

The problem can be reduced by: -

- a. Using directional antennas and equipment that can select between a wide-range of available frequencies reduces this risk. It can also be reduced through remote access from engineers who can login and re-tune equipment remotely if needed

- b. For critical, major trunk 'back-haul' routes, the wireless units used are generally licensed frequencies (with an annual cost) to avoid interference
- c) Latency of control can be a further disadvantage (time between move of joystick to actual movement of the camera) without careful engineering consideration
- d) Initial deployment expensive
- e) More 'in line' equipment to go wrong
- f) Line of sight (LOS) generally required
- g) Trees/foliage and scaffolding require managing and keeping under control

Wireless Security

Of course the security of any network that could be eavesdropped is very important and the Council needs to be convinced that the data in its systems will be secure and not be susceptible to cyber crime and hacking. The wireless network security is therefore of paramount importance in the selection of radio equipment and the network design.

The primary considerations are summarised below, all of which contribute to ensure the highest level of security: -

- All radio's deployed will have encryption capability that satisfy the requirements of the COAD document for Civil Traffic Enforcement, understood to be AES128 or higher
- The radios use their unique custom protocol (as distinct to a universal Wi-Fi 802.11 standard) and therefore it would require a radio of the same type to be able to eavesdrop. There are then additional levels of security within the product such as password protection and encryption to ensure those with the same units cannot access the radios.
- For radio propagation directional antenna is used and installed at rooftop level; this has the added security benefit of making it much less possible for anyone to even detect the radio signals
- If anyone were to attempt to eavesdrop the radio signal they would have to position another radio within the path – this would have the effect of causing the radio link to stop working (and therefore preventing any transmission from being detected)
- Typical product security features include:
 - AES encryption
 - Storm / flood protection
 - Password protection
 - Secure command-line access via SSH protocol

Recommendation 2: Where it is possible, the CBC IT network is used for the transmission of CCTV images

Coupled with the use of wireless transmission, the council will need to use hub points at various locations where recording of camera images will take place; these will need to be linked either to an IP circuit using the council LAN or the BT RS1000d service to enable a 'trunk' route to the control room location to enable viewing and copying.

The Councils IT Team are not confident there will be sufficient bandwidth between the routes/towns that we may require. Although we have shown the use of the Council IP network on the schematics, we have also sought prices from BT for the provision of up to 100 Mbs of bandwidth. Of course, if the Council IP network already exists and CCTV data/traffic can share the 'pipe', this will be much more cost effective than having to install new links supplied by BT which will incur on-going annual costs.

In our estimation, if we use the council's IT networks, we will need the maximum following bandwidths (if we stream all cameras and don't record locally. The actual requirement will be less than this if as intended, NVR's are situated close to the cameras and data only 'requested' and transmitted when viewing or downloading takes place.

- Houghton Regis Public Library – 70Mbps
- Leighton Buzzard Public Library (if we can establish LOS between that and the MSCP) – 30Mbps
- Sandy Public Library – 30Mbps
- Shefford Public Library – 10Mbps

The BT 100 Mbs service costs to link the hub sites will be circa £52,000 capital and £8,000 p.a. revenue costs, but does include the £17,000 capital and £2,000 revenue to link to the two police stations to enable the downloading of images by officers investigating offences. These costs are in addition to those already paid for an analogue service but which we hope to replace the majority with wireless where there is LOS. Where this LOS is not possible, even with 'hops', we will need to retain the existing fibre optic circuits which will need to be upgraded to an IP circuit if the council wishes to embrace HD camera technology.

If the Councils network cannot be used for whatever reason, the BT fibre optic service of RS1000d (100Mbps) will be used and be connected at the following sites: -

- Dunstable – Grove Theatre
- Leighton Buzzard – Multi-Storey Car Park
- Houghton Regis – Public Library
- Biggleswade – Street cabinet close to lamppost camera number 526
- Sandy – Public Library

- Shefford – Public Library

Clearly, if the Council network can be used where this is available close to the CCTV recording and 'hub' points, it will support and complement the use of the cameras without duplicating transmission paths and capital and revenue costs.

It is recommended that the Council investigates its network bandwidth capacity and where, with an agreed Quality of Service (QoS) it is possible to transmit CCTV images, this network is adopted in preference to purchasing third party data circuits.

Recommendation 3: Purchase of new CCTV Command and Control software/hardware and Network Video Recorders

The existing CCTV control software solution is a 7-year old Synectics Control and Digital Recording Systems installed at Dunstable. The mixture of Analogue Matrix Switching Digital Recording and Synergy Pro graphical user 'front end' (controller interface/GUI) provide the main technical 'building blocks' to the integrated CCTV solution. The systems' hardware and software are nearing the end of life; some of the functionality aspects of the Synectics equipment is no longer supported, such as with some Microsoft products. The existing Synectics Synergy Pro software is version is no longer produced and has been superseded by Synergy 3, which continues to be developed with additional, functionality. It is also important to understand that this Synectics recording equipment is now End of Life and should it fail, spare parts may not be available to repair the system.

The Council does not necessarily need to adopt the Synectics software and recording option with the future upgrade of system. It will be up to the shortlisted integrators/installers to propose a solution based on the councils' operational requirements and to propose a software and recording platform that meets the council's needs.

We are proposing that the recording of CCTV data from each of the cameras is carried out remotely in order that images are not sent to the control room if they are not to be viewed or copied. There will be restrictions due to the bandwidth capacity on how many simultaneous camera streams can be transmitted to the control room but in our experience, not all cameras need to be viewed at the same time; some are used more during daylight hours for dealing with incidents such as following shoplifting offenders and others during the hours of darkness which generally might be dealing with public disorder incidents.

We are also be proposing that where possible, the control room will be fitted with display wall drivers, which will make it easier for one operator to control what is displayed on the video wall in front of them and this can be changed by just one click of the mouse on the Graphic User Interface (GUI).

We are also proposing to record images for all cameras in 'real-time' of 25 images per second (ips). Although the current recording of the PSS CCTV images on the Council system is retained for 21 days before being overwritten, due to the guidelines issued in the National CCTV Strategy this recommends a minimum of 31 days retention. This of course is subject to the council's justification that images will be kept no longer than necessary.

Recommendation 4: Enhance the CCTV Control Room to provide additional services

The upgrade of the PSS CCTV hardware/software, the migration of transmission from fibre optic cabling to wireless (with the potential 'add-on' benefit of public Wi-Fi) and the relocation of the Council CCTV control room will enable the Council to: -

- Act on better and faster management information
 - The proposed upgraded Control Centre managing many council and stakeholder CCTV systems and coordinating various responses on behalf of the Council would provide it with the opportunity to make better, quicker and faster strategic and tactical decisions by: -
 - Creating a more holistic, integrated and simplified view of the service delivery picture within the Council
 - Improving situational awareness leading to actionable insights and co-ordinated approach
 - Placing a range of information at the fingertips of decision-makers
 - Being better able to share knowledge across the councils' departments
 - Reducing costs for the installation of public Wi-Fi
- Provision and management of a coherent and efficient organisational and operational unit
 - The upgrade of systems and the management of all CCTV systems will facilitate the co-ordination of resources (including staff and hard assets)
 - Interoperability will increase efficiency
 - Peaks in operations (if CareLine is introduced), complement rather than conflict with each other enabling resources and systems to be used more efficiently
- Foster collaboration amongst stakeholders/partners, including the Bedfordshire Police and neighbouring local authorities

The co-location of other council services to any control room would create the following opportunities to improve efficiency and effectiveness for the following categories: -

Resources	Efficiency/Effectiveness
Property	<ul style="list-style-type: none"> Rationalisation of the property portfolio/space by consolidating and co-locating operational entities Opportunity to:- <ul style="list-style-type: none"> Drive open data standards
Technology	<ul style="list-style-type: none"> Consolidating corporate and operational technology Collaboration through virtual integration Efficiency gains by leveraging emerging technology Achieve service resilience Install 'FOC' public Wi-Fi at a fraction of the cost
People	<ul style="list-style-type: none"> Opportunity to optimally utilise and up-skill the staff complement

A compilation of the type of service benefit and opportunities the new, enhanced control room could offer are suggested below.

Service	Opportunities
Control/CCTV Centre	<ul style="list-style-type: none"> Able to obtain geographic Central Bedfordshire Council-wide Public Space Surveillance CCTV images to make informed decisions from across the council area; Dunstable, Leighton Buzzard (& MSCP), Houghton Regis, Sandy, Biggleswade, Shefford, etc. Opportunities for technology development for internal and external clients, potential income from offender tagging, GPS tracking and CareLine, 24/7 co-ordination centre, Reduced costs for other local authority services (alarm monitoring)
Traffic	<ul style="list-style-type: none"> Opportunity to consider the use of CCTV for Traffic Enforcement purposes Provide traffic information for the end users via various platforms (RTPI, web, mobile, SMS)
Customer Service	<ul style="list-style-type: none"> An enhanced "out of hours" customer service
Environment and Leisure	<ul style="list-style-type: none"> Potential to monitor 'other' CBC CCTV systems; Traffic Depots, Waste Recycling Centres, Leisure Centres, Libraries
Body Worn Video (BWV)	<ul style="list-style-type: none"> Potential to monitor live BWV from personnel at Waste Recycling Centres, Civil Enforcement Officers (CEO's), gypsy/traveller enforcement officers, etc.

We believe irrespective of the final choice of CCTV control room, consideration is made to enhance the provision of services with a 24/7/365 service to maximise potential benefits.

ShopWatch/PubWatch radio system is operated to enable CCTV operators to be alerted to activities that other radio users think they should focus their cameras on to surveil. Should it be decided to relocate the CCTV control room to Priory House, it will be essential to ensure any radio signals currently used at the Dunstable and Leighton Buzzard can be operated without the loss of this vital aspect that maximises the use and benefit of PSS CCTV. The

Council may wish to adopt a more advanced ShopWatch IP digital radio system, the costs of about £3,500 are applicable. There will be minor costs associated with the relocation of the police Airwave radio system.

The Biggleswade ShopWatch system is currently monitored at Stevenage and this system would need to be integrated into the CBC control system wherever this is located.